CRS-300

1:10 Redundancy Switch
Installation and Operation Manual

Comtech EF Data is an
AS9100 Rev B / ISO9001:2000
Registered Company

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.

Part Number MN/CRS300.IOM Revision 16

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CRS-300 1:10 Redundancy Switch. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the CRS-300.

Related Documents

Comtech EF Data CDM-570/570L Satellite Modem Installation and Operation Manual

Comtech EF Data CDM-600/600L Open Network Satellite Modem Installation and Operation Manual

Comtech EF Data CDM-625 Advanced Satellite Modem Installation and Operation Manual

Comtech EF Data CDM-Qx Multi-Channel Satellite Modem Installation and Operation Manual

Comtech EF Data CDM-700 High-Speed Satellite Modem Installation and Operation Manual

Comtech EF Data CDM-710 Broadcast Satellite Modem Installation and Operation Manual

Comtech EF Data CDM-710G High-Speed Satellite Modem Installation and Operation Manual

Comtech EF Data SLM-5650 Satellite Modem Installation and Operation Manual

Comtech EF Data SLM-5650A Satellite Modem Installation and Operation Manual

Comtech EF Data CRS-280L 1:N Redundancy Switch Installation and Operation Manual

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Comtech EF Data Technical Publications department:

TechnicalPublications@comtechefdata.com

Conventions and References

Cautions and Warnings

IMPORTANT or NOTE indicates a statement that is associated with the task being performed or information critical for proper equipment function.

CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-Metric to Metric conversions.

Recommended Standard Designations

The Recommended Standard (RS) designation has been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designation may be shown when depicting actual text displayed on the front panel screen, or on the panels of the pluggable interfaces (RS-232, RS-485, etc.). All other references in the manual are shown using the EIA designation.

Trademarks

Windows is a trademark of the Microsoft Corporation.

Other product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

Electromagnetic Compatibility (EMC) Compliance

This is a Class A product. In a domestic environment, it may cause radio interference that requires the user to take adequate protection measures.

EN55022 - 1997 Compliance

This equipment meets the radio disturbance characteristic specifications for information technology equipment as defined in EN55022.

EN55024 - 1998 Compliance

This equipment meets the EMC/immunity characteristics for the limits and methods of measurement for information technology equipment per EN55024-1998.

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference; in which case, users are required to correct the interference at their own expense.

NOTE

To ensure compliance, properly shielded cables for DATA I/O shall be used. More specifically, these cables shall be shielded from end to end, ensuring a continuous shield.

Safety Compliance

EN 60950

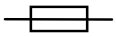
Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950. This equipment meets the Safety of Information Technology Equipment specification as defined in EN60950.

Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (2006/95/EC):

<HAR>	Type of power cord required for use in the European Community.
	CAUTION: Double-pole/Neutral Fusing **ACHTUNG:** Zweipolige bzw. Neutralleiter-Sicherung

International Symbols:

Symbol	Definition
~	Alternating Current
	Fuse

Symbol	Definition
	Protective Earth / Safety Ground
	Chassis Ground

NOTE

For additional symbols, refer to* Cautions and Warnings *listed earlier in this Preface.

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90-day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Customer Support

Refer to the Warranty Policy, p. xviii, for information regarding this product's warranty.

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Reporting comments or suggestions concerning manuals
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data number)
480.333.4357 (Customer Support Desk)
480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.
- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.
- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Online Customer Support

An **RMA number request** can be requested electronically by contacting the Customer Support Department through the online support page at **www.comtechefdata.com/support.asp**:

- **Click** on the "Service" hyperlink, then read the "Return Material Authorization" section for detailed instructions on our return procedures.
- **Click** on the "RMA Request Form" hyperlink, then fill out the form completely before sending.
- **Send e-mail** to the Customer Support Department at **service@comtechefdata.com**.

Chapter 1. INTRODUCTION

1.1 Overview

This chapter provides an overview, description and specifications for the CRS-300 1:10 Redundancy Switch and its optional IF and ESC Switch components:

CRS-300
1:10 Redundancy Switch

CRS-280
IF Switch (70/140MHz) [Optional]

CRS-280L
IF Switch (L-Band) [Optional]

CRS-350
Engineering Service Channel (ESC) Switch [Optional]

The CRS-300 1:10 Redundancy Switch (referred to throughout this manual as the Switch) provides fully automatic protection of traffic circuits in the case of equipment failure. The user can configure the CRS-300 to back up (replace) a Traffic modem when a Unit Fault and/or a Tx/Rx traffic Fault occurs.

Intended for hub applications, the CRS-300 is compatible for use with the Comtech EF Data Modems specified in **Table 1-1**. While the Switch is capable of controlling any of these specified modems, note that it is important that only one type of modem may be connected within a given Switch system; this is because the redundant modem must operate identically to the configured traffic modem.

A key feature of the CRS-300 architecture is its ability to allow the redundant modem to 'bridge' a traffic modem. The Switch automatically configures the redundant modem to match the bridged modem's configuration. The Switch also copies the bridged modem's terrestrial transmit clock/data and routes it to the redundant modem. When using the CRS-280/280L, it additionally routes the bridged modem's Rx IF. Because this live traffic is used at all times to verify performance, no external test equipment is needed to determine the health of the redundant modem.

Construction features: The CRS-300 is modular in construction – all replaceable modules insert into slots in the back panel. This includes the controller, Redundant Modem Interface (RMI), Traffic Modem Interfaces (TMIs), and Power Supply Units (PSUs).

Because power consumption is below 30 watts for a fully populated Switch, no fan cooling is required.

Key Reliability Features: The CRS-300 incorporates the following key reliability features:

- Twin, independent, AC or DC power supplies.
- Traffic Modems with differing data types can all be supported by the Redundant Modem – the exception to this is the CDM-Qx/QxL and, with some limitations, the CDM-625.
- Primary traffic paths are maintained, error-free, when power is removed.
- TMIs can be completely removed from the CRS-300, with cables still attached, and traffic is not interrupted or affected.
- RMI and/or TMIs can be replaced without disturbing other traffic circuits.

Interfaces: The CRS-300 supports all of the modems' available interface types, which include EIA-530/-422, V.35, Sync EIA-232, ASI, Balanced or Unbalanced G.703, LVDS, Single-port Ethernet Bridge Mode, and HSSI.

Ease of Connection: Connection to the traffic modems and the redundant modem is remarkably easy – rack cabling is simplified and the number of potential failure points is reduced.

For the CDM-570/570L, CDM-600/600L, or CDM-625: When using the multi-protocol interface, only a single cable – carrying all data signals, alarm information and the serial remote control interface – is required for each modem.

If the G.703 interfaces are used: One additional cable is required.

For the CDM-Qx/QxL: These modems require an additional RS-485 multi-drop cable from the Switch to all modems to provide remote control interface capability.

For EIA-232/-485 M&C User connections: A direct user-to-modem serial EIA-232/-485 communication connection is not permissible when connected to the CRS-300. The user must instead connect to the DB-9 "Remote" connector on the CRS-230 System Controller (installed on

the CRS-300). For detailed information on remote addressing schemes, refer to **Appendix B. ADDRESSING SCHEME INFORMATION**.

TMI Monitoring: Terrestrial user clock and data signals to and from a traffic modem are routed through a TMI via a set of relays. This is arranged so that the de-energized (unpowered) state connects the data signals directly through to the traffic modem. If the power supplies to the system are lost, or if a traffic-carrying TMI is removed, no interruption of the traffic occurs. It should also be noted that, in normal circumstances where the redundant modem is not in service, no data is carried through the CRS-300 backplane – all data is routed via the TMI.

CRS-350 Option: Where protection of the IDR overhead signals (backward alarms, audio ESC, data ESC, etc.) is desired, the CRS-350 module may be added.

CRS-280/280L Option: The CRS-280 (70/140 MHz) Switch is required when one or more modem within the redundancy group connects to more than one up/down converter. This occurs when the modems connect to more than one transponder on the same antenna polarization, or when modem redundancy needs to span two or more polarizations or antennas.

Operation with the CRS-280L (L-Band) Switch is necessary when one or more modems within the redundancy group connect to the other polarization of the antenna or to multiple antennas.

Refer to the* CRS-280L 1:N Redundancy Switch Installation and Operation Manual *for detailed information about this optional switch.

The system may forgo using the CRS-280/280L and, in its place, passively combine or split the modulator outputs and demodulator inputs when the entire group of modems is connected to the same up/down converter. In these applications, the CRS-300 mutes the faulted modem's Tx carrier and enables the standby unit's carrier.

Figure 1-2 depicts an operational schematic for the CRS-280/280L interface.

1.2 CRS-300 Compatibility

Table 1-1 shows the Comtech EF Data modems that are compatible for use with the CRS-300 1:10 Redundancy Switch.

Table 1-1. CRS-300 Compatibility Table

Modem	Optional Switches
CDM-570	CRS-280 IF Switch (70/140 MHz)
CDM-570L	CRS-280L IF Switch (L-Band)
CDM-600 Note 1	CRS-280 IF Switch (70/140 MHz) CRS-350 ESC Switch (IDR Overhead)
CDM-600L Note 1	CRS-280L IF Switch (L-Band) CRS-350 ESC Switch (IDR Overhead)
CDM-625 Note 1	CRS-280L IF Switch (L-Band) CRS-350 ESC Switch (IDR Overhead)
CDM-Qx	CRS-280 IF Switch (70/140 MHz)
	NOTE ***Up to one modulator and one demodulator allowed per CDM-Qx/QxL.***
CDM-QxL	CRS-280L IF Switch (L-Band)
	NOTE ***Up to one modulator and one demodulator allowed per CDM-Qx/QxL.***
CDM-700 CDM-710 CDM-710G	CRS-280 IF Switch (70/140 MHz) CRS-280L IF Switch (L-Band)
SLM-5650/5650A	CRS-280 IF Switch (70/140 MHz) CRS-280L IF Switch (L-Band) CRS-350 ESC Switch (IDR Overhead)

Compatibility Notes:

1. The CDM-625 Open Network Satellite Modem, with its available CDM-600 Emulator Mode, serves as an operationally transparent replacement unit for the CDM-600/600L Open Network Satellite Modems.

2. The CiM-25, Comtech EF Data's low-cost Internet Protocol (IP) Monitor & Control (M&C) interface for existing CEFD modems, is not compatible for use on modems operating within a CRS-300 redundancy system. Taking this prohibition of use under further consideration, the CiM-25 should **not**, *under any circumstances*, be connected to the Remote port on the CRS-300's CRS-230 Controller card for control of the Switch and modems.

1.3 System-Level Block Diagram

Figure 1-1 shows the system-level block diagram of the CRS-300 1:10 Redundancy Switch, including the optional CRS-280/280L IF and CRS-350 ESC Switches.

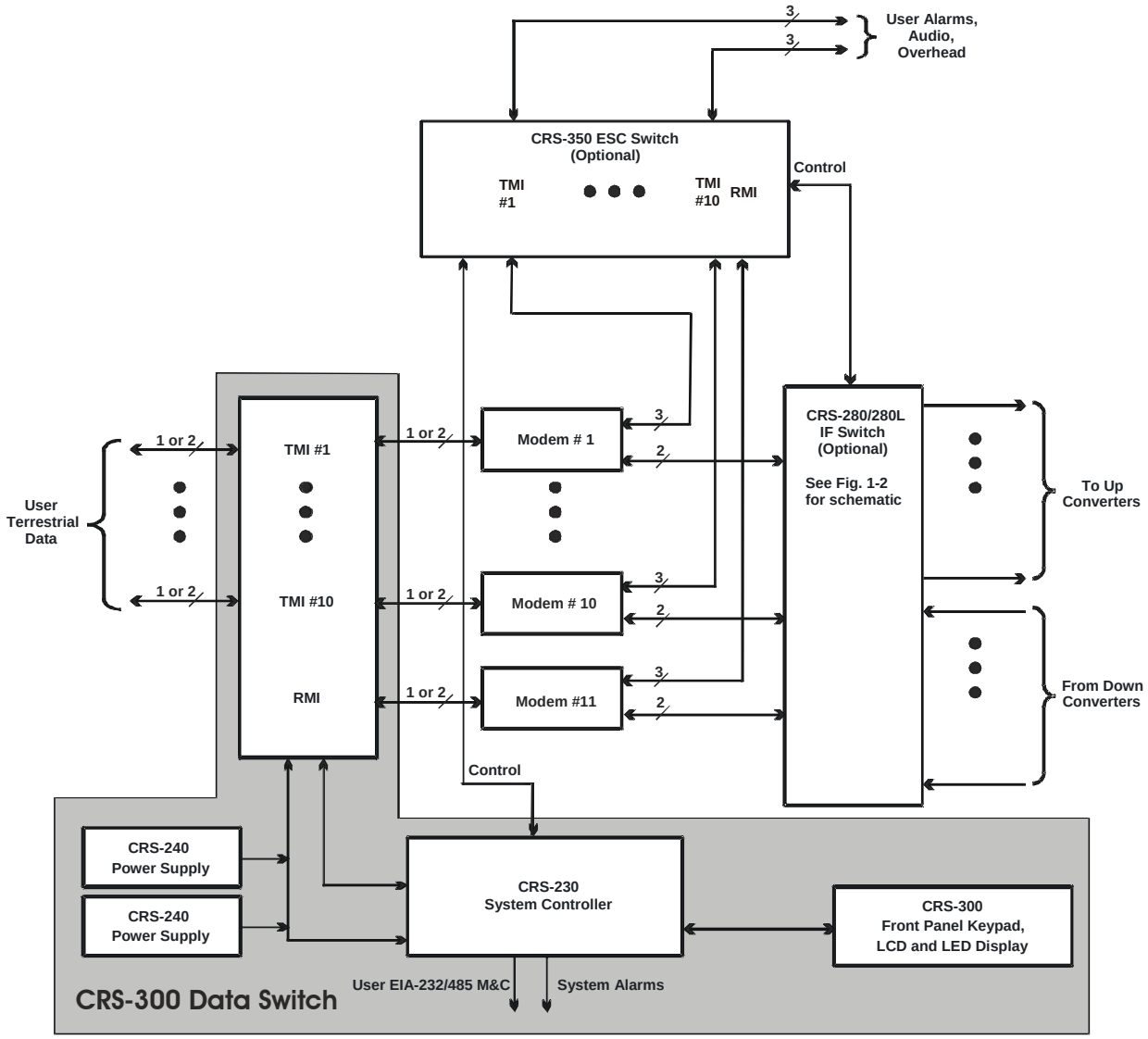


Figure 1-1. Typical Redundancy System-Level Block Diagram

1.3.1 CRS-280/280L Functional Schematic

Figure 1-2 provides an operational schematic for the CRS-280/280L IF Switch.

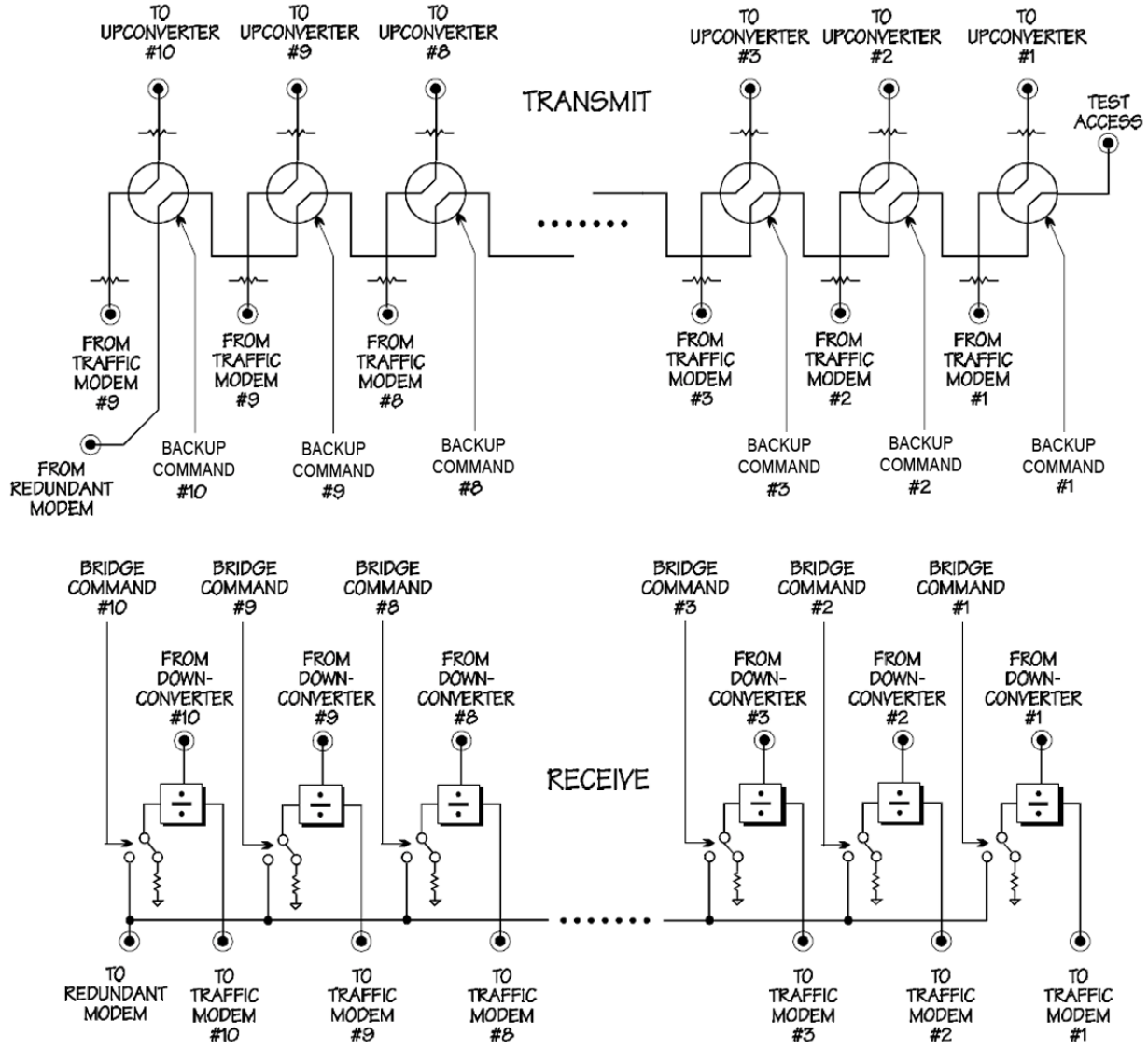


Figure 1-2. CRS-280/280L IF Switch Operational Schematic

1.4 Description of CRS-300 Features

1.4.1 Front Panel

Figure 1-3 illustrates the CRS-300 front panel. The CRS-300 is constructed as a 4RU-high, rack-mounting chassis that can be freestanding, if desired. It is provided with rack handles at the front for easy removal from and placement into a rack.

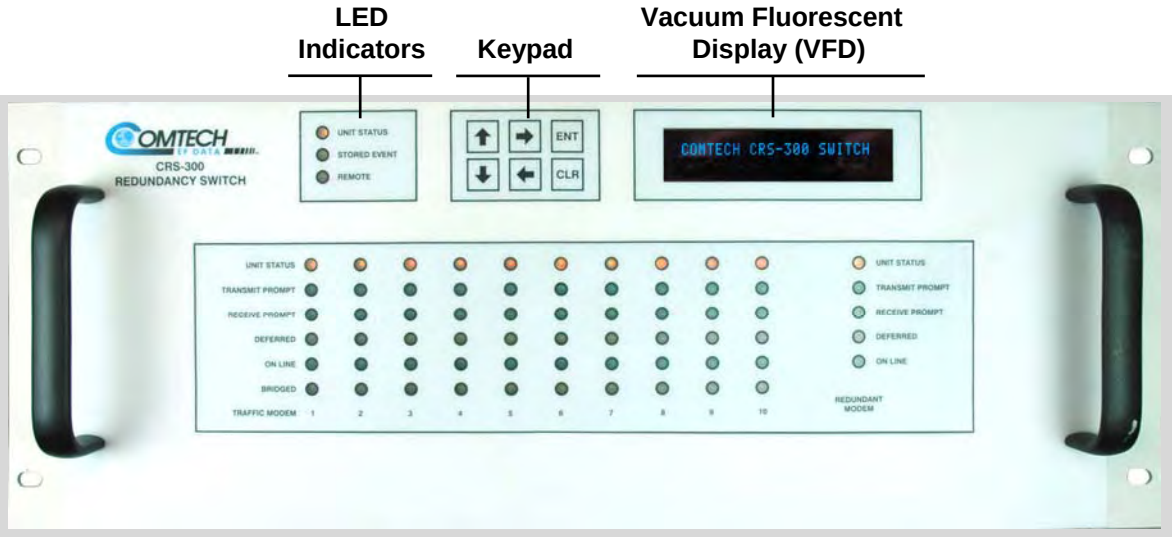


Figure 1-3. CRS-300 Front Panel

1.4.2 Rear Panel

Figure 1-4 shows the back panel of the CRS-300 with a typically configured mix of TMI cards.

NOTE

Because the RMI can have the capability for several TMIs, depending on user requirements the CRS-300 may be able to use several different TMI cards simultaneously.

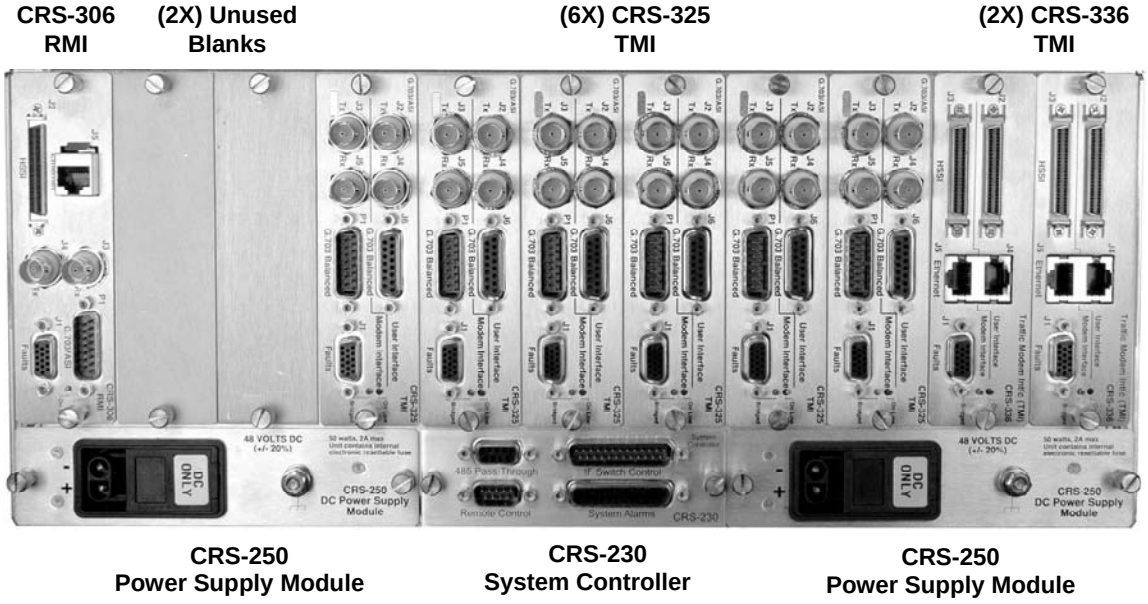


Figure 1-4. CRS-300 Rear Panel – Configuration Example

1.4.3 Modem Interface Cards: CDM-570/570L, -600/600L, -625

The following tables indicate which TMI (Traffic Modem Interface) cards and which RMI (Redundant Modem Interface) cards should be used with each modem and data type:

CDM-570/570L Modems		
Data Type	**TMI Type**	**RMI Type**
G.703 T1/E1 Bal/Unbal	CRS-330 or CRS-340	CRS-310
EIA-422, V.35, EIA-232	CRS-340	

CDM-600/600L Modems, CDM-625 Modem (in CDM-600 Emulator Mode)		
Data Type	**TMI Type**	**RMI Type**
G.703 Bal (DDI, IDO, DDO, IDI) Notes 1, 2 G.703 Unbal (DDI, IDO, DDO, IDI) Notes 1, 2	CRS-330	CRS-310
EIA-422/V.35, EIA-232, LVDS	CRS-340 Note 3	
G.703 Bal (DDI, IDO, DDO, IDI) Notes 1, 2 G.703 Unbal Notes 1, 2		
Converts LVDS (Modem) to/from HSSI (User)	CRS-370	

CDM-625 Modem		
Data Type	**TMI Type**	**RMI Type**
EIA-422, V.35 10/100 Ethernet Note 4	CRS-316 Notes 5, 6	CRS-310
ASI Notes 5, 6 G.703 Bal (DDI, IDO, DDO, IDI) Note 2 G.703 Unbal Note 2	CRS-325 Notes 5, 6	
G.703 Bal (DDI, IDO, DDO, IDI) Note 2 G.703 Unbal (DDI, IDO, DDO, IDI) Note 2	CRS-330	
HSSI 10/100 Ethernet Note 4	CRS-336 Notes 5, 6	
EIA-422, V.35, LVDS G.703 Bal (DDI, IDO, DDO, IDI) Note 2 G.703 Unbal Notes 1, 2	CRS-340 Note 3	
Quad E1	CDS-365D Notes 5, 6	

Notes:

1. For CDM-600 modem to switch data (Bal and Unbal) use DB-15 to DB-15 data cable.
2. For CDM-625 modem to switch data (Bal and Unbal) use DB-9 to DB-15 data cable.
3. As of September 2008, the CRS-320 TMI is obsolete. Use the CRS-340 TMI in its place.
4. For CDM-625 where the terrestrial data type is Ethernet, the User can use only one of any four Ethernet ports on the CDM-625 rear panel in Ethernet Bridge Mode.
5. From Redundant Modem to RMI, use DB-25 to DB-25 Control cable.
6. From Traffic Modem to TMI, use DB-9 to HD-15 Control cable.

1.4.3.1 RMI Card: CDM-570/570L, -600/600L, -625

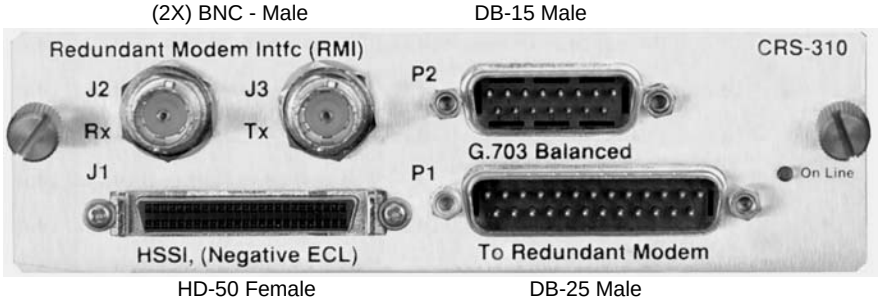
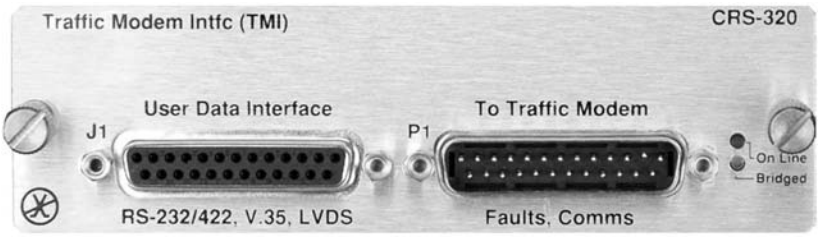


Figure 1-5. CRS-310 RMI (PL/9579-1)

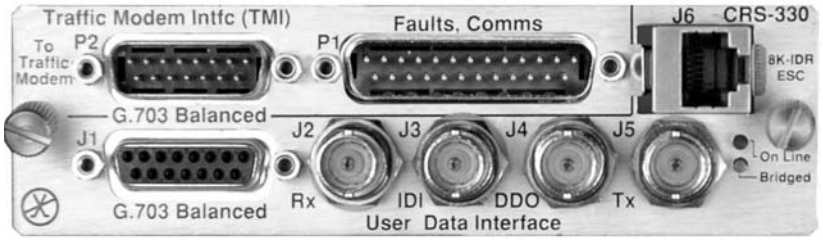
1.4.3.2 TMI Cards: CDM-570/570L, -600/600L, -625

Figure 1-6. CRS-320 TMI EIA-232/-422 (PL/9581-1)
OBSOLETE
REPLACED BY
CRS-340



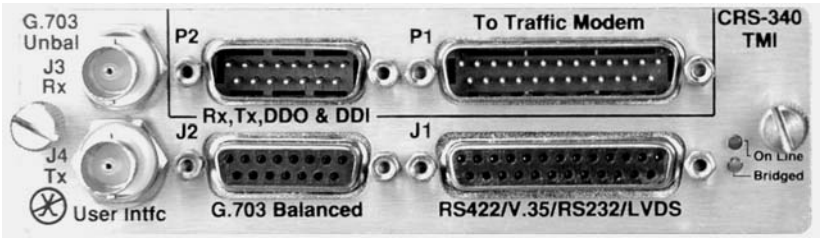
DB-25 Female DB-25 Male
DB-15 Male DB-25 Male RJ-45

Figure 1-7. CRS-330 TMI G.703 (PL/9033-1)



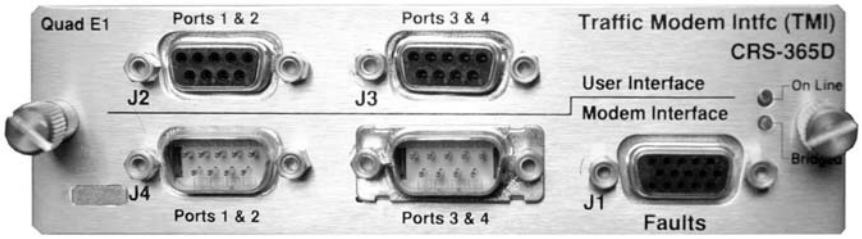
DB-15 Female (4X) BNC - Female
DB-15 Male DB-25 Male

Figure 1-8. CRS-340 TMI EIA-232/-422 or LVDS or G.703 (PL/9387-1)



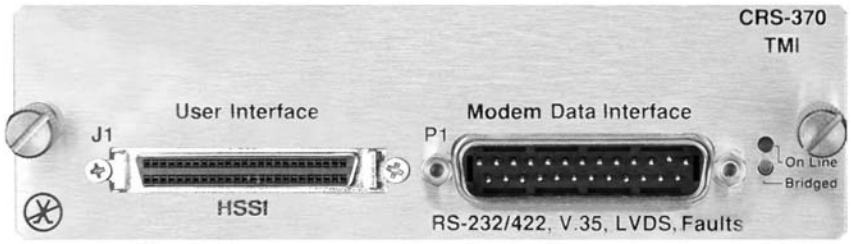
(2X) BNC - Male DB-15 Female DB-25 Female
DB-9 Female DB-9 Female

Figure 1-9. CRS-365D TMI E1 (1-4 ports) (PL/12985-2)
FOR USE WITH
CDM-625 ONLY



DB-9 Male DB-9 Male HD-15 Female

Figure 1-10. CRS-370 TMI HSSI (PL/9034-1)
FOR USE WITH
CDM-600 ONLY



HD-50 Female DB-25 Male

IMPORTANT

Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for RTS/CTS, DTR/DSR (CRS-320 (obsolete) or CRS-340 TMIs) and CA/TA (CRS-370 TMI). Refer to* Chapter 4. MODEM, TMI AND SWITCH CONFIGURATION *for this important configuration information.

1.4.4 Modem Interface Cards: CDM-Qx/QxL, -700, -710, -710G, SLM-5650/5650A

The following tables indicate the TMI (Traffic Modem Interface) and RMI (Redundant Interface) cards that should be used with each modem and data type:

CDM-Qx/QxL Modems		
Data Type	**TMI Type**	**RMI Type**
EIA-530/-422/V.35, EIA-232	CRS-316 Note 1	CRS-305
G.703 T1/E1 Bal D&I , Unbal	CRS-325	
HSSI	CRS-336 Note 2	
Quad E1	CRS-365	

CDM-700 Modem		
Data Type	**TMI Type**	**RMI Type** Note 3
OC3 Copper	CRS-325	CRS-306
HSSI or GigE	CRS-336 Notes 2, 4	
G.703 (E3/T3/STS-1) UnBal 1 to 4 Ports	CRS-345	

CDM-710 Modem		
Data Type	**TMI Type**	**RMI Type**
ASI	CRS-325	CRS-306
HSSI or GigE	CRS-336 Note 4	

CDM-710G Modems		
Data Type	**TMI Type**	**RMI Type**
G.703 Unbal	CRS-325	CRS-306
HSSI or GigE	CRS-336 Note 4	

SLM-5650/5650A Modems		
Data Type	**TMI Type**	**RMI Type** Note 3
MIL-STD-188-114, EIA-530/-422 or Single-port Ethernet Bridge Mode	CRS-316 Note 1	CRS-306 (GigE only) CRS-307
G.703 Bal/UnBal	CRS-325	CRS-306
HSSI or Single-port Ethernet Bridge Mode	CRS-336 Notes 2, 4	CRS-306/307

Notes – As of April 2007:

1. Use CRS-316 instead of CRS-315. To maintain older TMIs in the field, Switch firmware must also support the CRS-315.
2. Use CRS-336 instead of CRS-335. To maintain older TMIs in the field, Switch firmware must also support the CRS-335.
3. Use CRS-306 instead of CRS-305. To maintain older RMIs in the field, Switch firmware must also support the CRS-335.
4. For modems where the terrestrial data type is Ethernet, the User can use only one Ethernet port in Single-port Ethernet Bridge Mode, on the modem rear panel (when using the optional Ethernet interface).

1.4.4.1 RMI Cards: CDM-Qx/QxL, -700, -710, -710G, SLM-5650/5650A

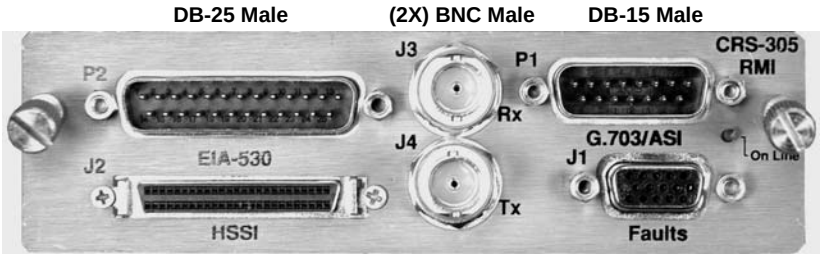


Figure 1-11. CRS-305 RMI (PL/11494-1)

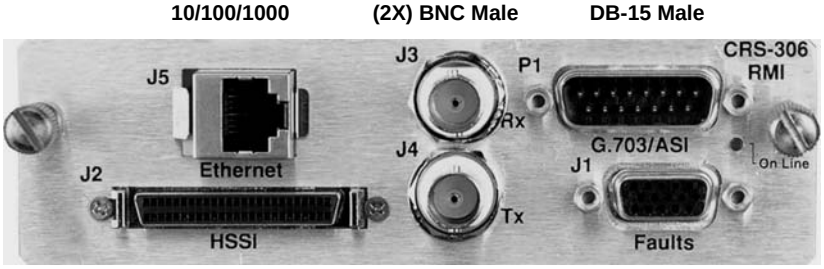


Figure 1-12. CRS-306 RMI (PL/11494-2)

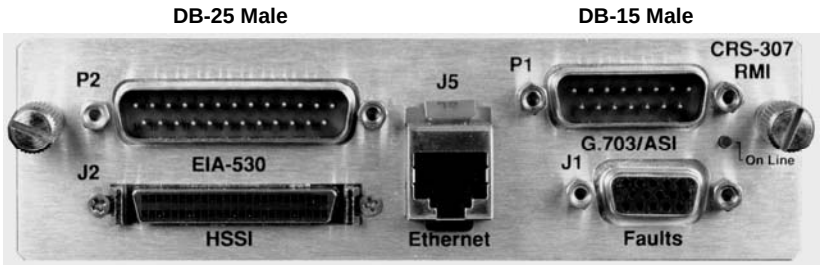


Figure 1-13. CRS-307 RMI (PL/11494-3)

1.4.4.2 TMI Cards: CDM-Qx/QxL, -700, -710, -710G, SLM-5650/5650A

Figure 1-14.
CRS-315 TMI
(PL/11493-1)

OBSOLETE

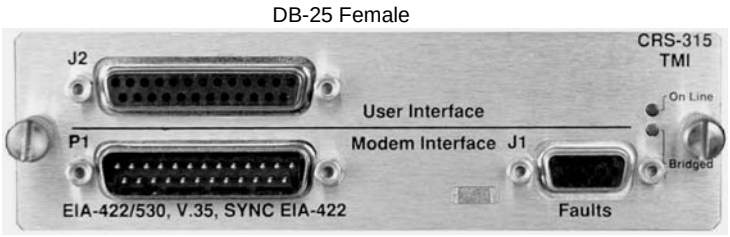


Figure 1-15.
CRS-316 TMI
RS422 or GigE
(PL/12498-1)

ALSO USED
WITH CDM-625

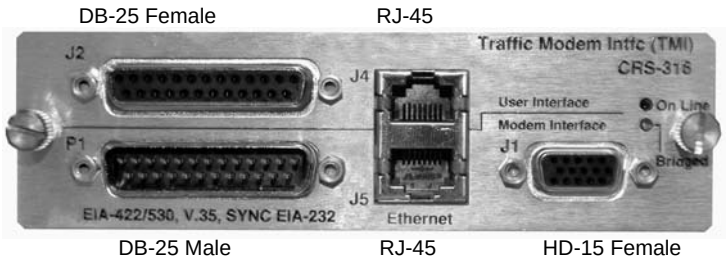


Figure 1-16.
CRS-325 TMI
G.703 or ASI
(PL/11492-1)

ALSO USED
WITH CDM-625

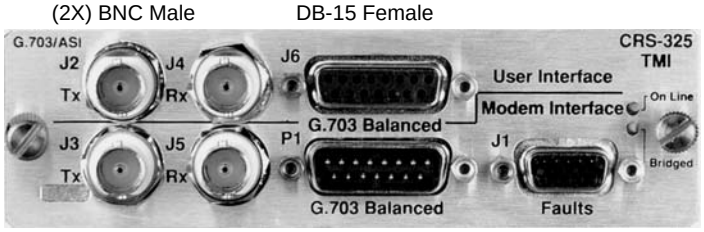


Figure 1-17.
CRS-335 TMI
(PL/11491-1)

OBSOLETE

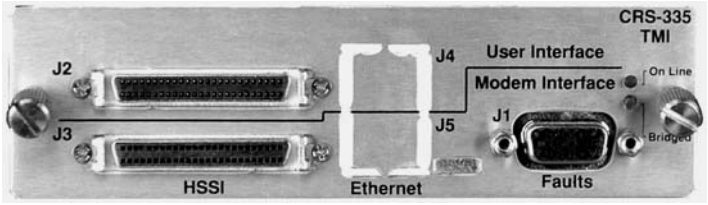


Figure 1-18.
CRS-336 TMI
HSSI or GigE
(PL/12499-1)

ALSO USED
WITH CDM-625

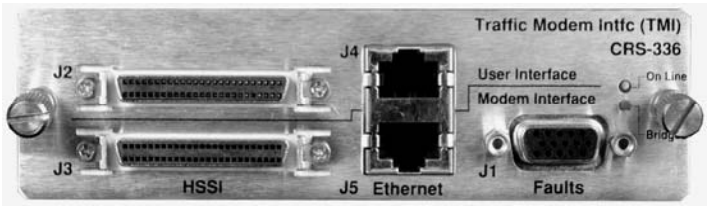


Figure 1-19.
CRS-345 TMI
G.703 (4 ports)
(PL/11495-1)

FOR USE WITH
CDM-700 ONLY

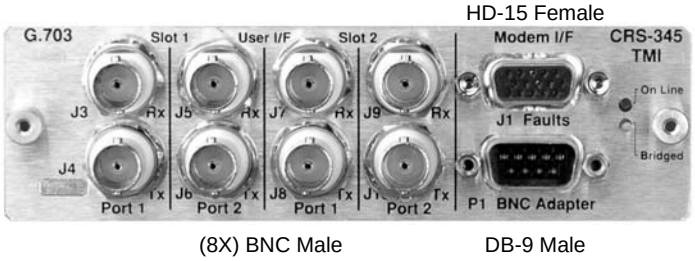
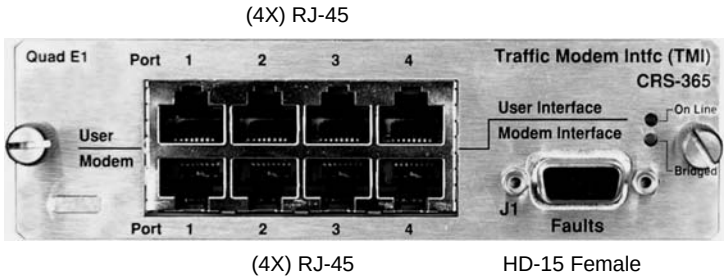


Figure 1-20.
CRS-365 TMI E1
(1-4 ports)
(PL/12985-1)
FOR USE WITH
CDM-Qx/QxL
ONLY



1.4.5 CRS-300 System Controller and Power Supply Card Assemblies

Figure 1-21.
CRS-230
System
Controller
(AS/0377)

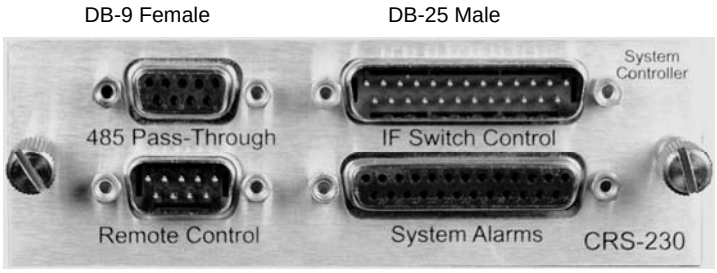
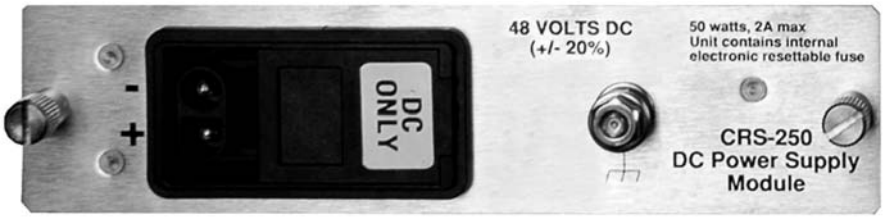


Figure 1-22.
CRS-240 AC
Power Supply
(AS/0376)

Figure 1-23.
CRS-250 DC
Power Supply
(PL/10458-1)



1.5 CRS-350 ESC Switch Description

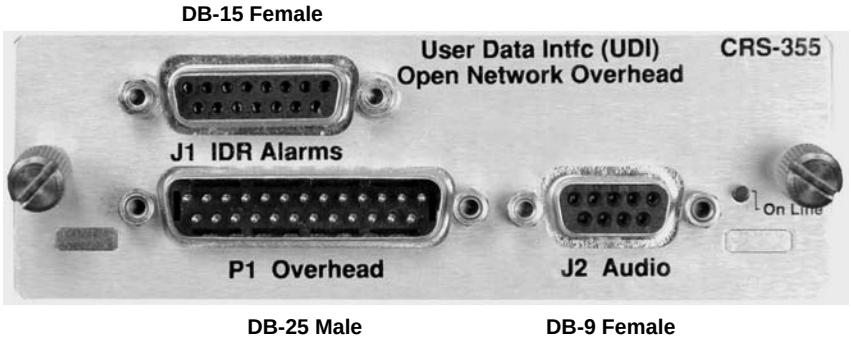
The CRS-350 is intended for use with the CDM-600/600L, CDM-625, and SLM-5650/5650A modems. The CRS-350 is constructed as a 3RU-high, rack-mounting chassis designed for mounting to the back of a 19-inch rack. See **Figure 2-1** in **Chapter 2. INSTALLATION** for an installation example.

Figure 1-24 shows the user interface side of the CRS-350 ESC Switch. Here, the User has access to the Audio, Overhead, and IRD connector interfaces featured on the CRS-355 User Data Interface (UDI).

Figure 1-24. CRS-350 ESC Switch – Front Panel

As explained in detail in the pertinent modem sections of **Chapter 5. CABLES AND CONNECTIONS**, the User's equipment should be connected directly to the ports on the UDI instead of connecting directly to the Traffic Modem's "Audio", "Overhead", and "IDR Alarms" ports. **Figure 1-25** shows the typical front panel for one of the (10) CRS-355 UDIs installed on the front panel of the CRS-350 ESC Switch.

Figure 1-25. CRS-355 UDI



The back of the CRS-350, shown in **Figure 1-26**, contains the same three connectors that correlate with their respective connectors on each of the modems.

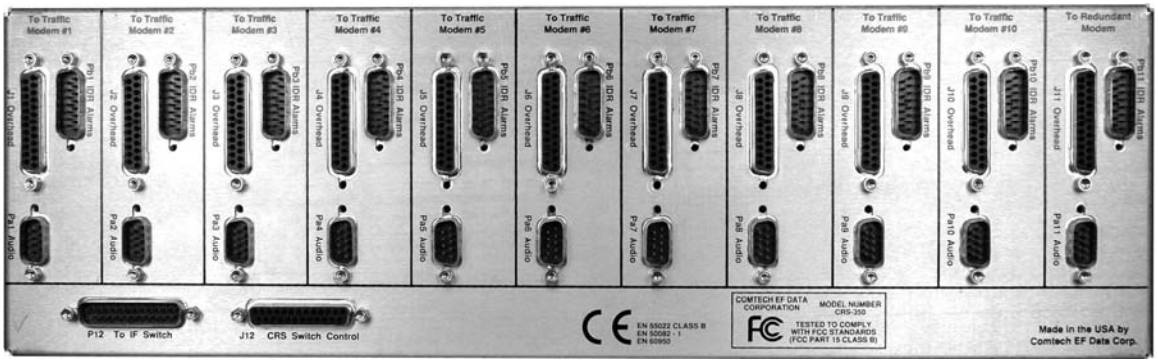

To Traffic Modem #1
To Traffic Modem #2
To Traffic Modem #3
To Traffic Modem #4
To Traffic Modem #5
To Traffic Modem #6
To Traffic Modem #7
To Traffic Modem #8
To Traffic Modem #9
To Traffic Modem #10
To Redundant Modem
P12 To IF Switch
J12 CRS Switch Control
COMTECH EF DATA CORPORATION
MODEL NUMBER CRS-350
TESTED TO COMPLY WITH FCC STANDARDS (FCC PART 15 CLASS B)
Made in the USA by Comtech EF Data Corp.

Figure 1-26. CRS-350 ESC Switch – Rear Panel

1.6 Summary of Specifications

1.6.1 CRS-300 Specifications

Characteristic	Requirement
Switch Type	1:N Redundancy Switch system (N=10 max), Bridging architecture C161 control processor
Compatible Modems	• CDM-570/570L • CDM-600/600L • CDM-625 • CDM-Qx/QxL • CDM-700 • CDM-710 • CDM-710G • SLM-5650/5650A
Operating Modes	• Fully automatic or manual • Force traffic modem to redundant modem • Remove selected traffic modem from control • Programmable holdoff-to-backup and holdoff-to-restore (from 1 to 99 seconds)
Switching Conditions	Switch to redundant modem following a Unit fault, Tx or Rx traffic faults
Switching Time	9 seconds max. (Delay interval set to minimum, 1 sec)
IF Switching	• CRS-300 without CRS-280/280L IF Switch: IF ON / OFF control through the Switch controller. • CRS-300 with CRS-280/280L: all modems outputs ON all the time.
Temperature	• 0 to +50°C (32 to 122°F) Operating • 50 to 100°C (122 to 212°F) Storage
Humidity	95% at +40°C (104°F), Non-condensing
CE Mark	EMC and Safety
Environmental	Operating temperature range: 0° to 40°C (32° to 104°F)
AC Prime Power	Two independent inputs: 100 to 250 VAC, 50/60 Hz, at 25 watts VA max
DC Prime Power	48 (38 to 60) VDC 25 watts max
Redundant Modem Signal Source	Any one of the 10 traffic paths (bridge mode) (both Rx IF and Tx data)
Front Panel	• Vacuum Fluorescent Display (VFD): 2 lines @ 24 characters/line. • 6-button Keypad: ENT (Enter), CLR (Clear), (4X) navigation • LED system status display showing, for all modems: o Unit fault, Rx traffic fault o Tx traffic alarm Online / Offline status o Bridge status
Audible Alarm	Programmable to activate following various changes of state
Common faults	Dry relay contacts
Dimensional Envelope	19W x 11.75D x 6.75H inch (48.26W x 29.85D x 17.15H cm) (4RU)
Weight	~ 20 lbs (~ 9.07 kg)

1.6.2 Modem vs. Terrestrial User Data Interface Specifications

Modem	TMI	User Data Type	User Data Connector(s)
CDM-570 CDM-570L	CRS-330	G.703 (Balanced/Unbalanced)	(1) DB-15F/ (2) BNC
	CRS-340	EIA-422, V.35, EIA-232	(1) DB-25F
		G.703 (Balanced/Unbalanced)	(1) DB-15F/ (2) BNC
CDM-600 CDM-600L	CRS-330	G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO, DDO, IDI)	(1) DB-15F (4) BNCs
	CRS-340	EIA-422, V.35,EIA-232, LVDS	(1) DB-25F
		G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO)	(1) DB-15F (2) BNCs
	CRS-370	HSSI (User)	(1)HD-50F
CDM-625	CRS-316	EIA-422, V.35	(1) DB-25F
		Single-port Ethernet Bridge Mode	(1) RJ45
	CRS-325	ASI	(2) BNCs
		G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO)	(1) DB-15F (2) BNCs
	CRS-330	G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO, DDO, IDI)	(1) DB-15F (4) BNCs
	CRS-336	HSSI	(1) HD-50F
		Single-port Ethernet Bridge Mode	(1) RJ45
	CRS-340	EIA-422, V.35, LVDS	(1) DB-25F
		G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO)	(1) DB-15F (2) BNCs
	CRS-365D	Quad E1 (1 to 4 Ports of E1)	(2) DB-9F
CDM-Qx CDM-QxL	CRS-316	EIA-530, V.35, EIA-232	(1) DB-25F
	CRS-325	G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO)	(1) DB-15F (2) BNCs
	CRS-336	HSSI	(1) HD-50F
	CRS-365	Quad E1 (1 to 4 Ports of E1)	(4) RJ45s
CDM-700	CRS-325	OC3 Copper	(2) BNCs
	CRS-336	HSSI	(1) HD-50F
		GigE (one port only)	(1) RJ45
	CRS-345	Multi-Port Unbal G.703 (1-4 ports)	(8) BNCs
CDM-710	CRS-325	ASI	(2) BNCs
	CRS-336	HSSI	(1) HD-50F
		GigE (one port only)	(1) RJ45
CDM-710G	CRS-325	G.703 Unbal	(2) BNCs
	CRS-336	HSSI	(1) HD-50F
		GigE (one port only)	(1) RJ45
SLM-5650/5650A	CRS-316	MIL-STD-188-114, EIA-530	(1) DB-25F
		GigE	(1) RJ45
	CRS-325	G.703 Bal (DDI,IDO, DDO, IDI) G.703 Unbal (DDI, IDO)	(1) DB-15F (2) BNCs
	CRS-336	HSSI	(1) HD-50F
		Single-port Ethernet Bridge Mode	(1) RJ45

1.6.3 CRS-280 and CRS-280L Specifications

Characteristic	Requirement	
	CRS-280 (70/140MHz)	CRS-280L (L-Band)
Tx/Rx Operating Freq	50 to 180 MHz	950 to 1950 MHz
Tx / Rx Connectors	BNC female	N-Type female (50Ω)
Return Loss	18 dB return loss into 75Ω (50Ω optional)	15 dB return loss into 50Ω
Transmit IF Loss/Flatness Tx In To Tx Uplink Out BU In To Any Uplink Out	-- < 1.5 dB over operating freq < 1.5 dB over operating freq	-- < 0.8 dB/0.5 dB over operating freq < 2.5 dB/1.0 dB over operating freq
Receive IF Loss/Flatness Rx Downlink In To Rx Out Any Downlink In To BU Out	-- < 5 dB over operating freq < 5 dB over operating freq	-- < 4.0 dB/0.5 dB over operating freq < 5.5 dB/1.0 dB over operating freq
Tx to Tx Channel Isolation	> 50 dB	> 70 dB
Rx to Rx Channel Isolation	> 50 dB	> 70 dB
Tx to Rx Channel Isolation	> 60 dB	> 90 dB
Powering of IF Switch	From the CRS-300 chassis	100 to 240 VAC 50/60 Hz (25W)
Power Supply	90-264 VAC, 50/60 Hz (25 W)	90-264 VAC
Fuse		
Dimensional Envelope (Rack Mount 4RU)	19W x 2.5D x 7H inches (48.26W x 6.35 x 18H cm)	
Weight	< 10 lbs (< 4.54 kg)	< 25 lbs (11.3 kg)

1.6.4 CRS-350 Specifications

Characteristic	Requirement
User Data Interfaces	(1) 25-pin 'D' male connector - ESC, overhead signals (1) 15-pin 'D' female connector - IDR Alarms (1) 9-pin ‘D’ female connectors - Audio
Power	From CRS-300
Dimensional Envelope (Rack Mount 4U)	19W x 4.0D x 7H inches (48.26W x 27.5D x 18H cm)
Weight	5 lbs (2.2 kg)

1.6.5 Dimensional Envelopes

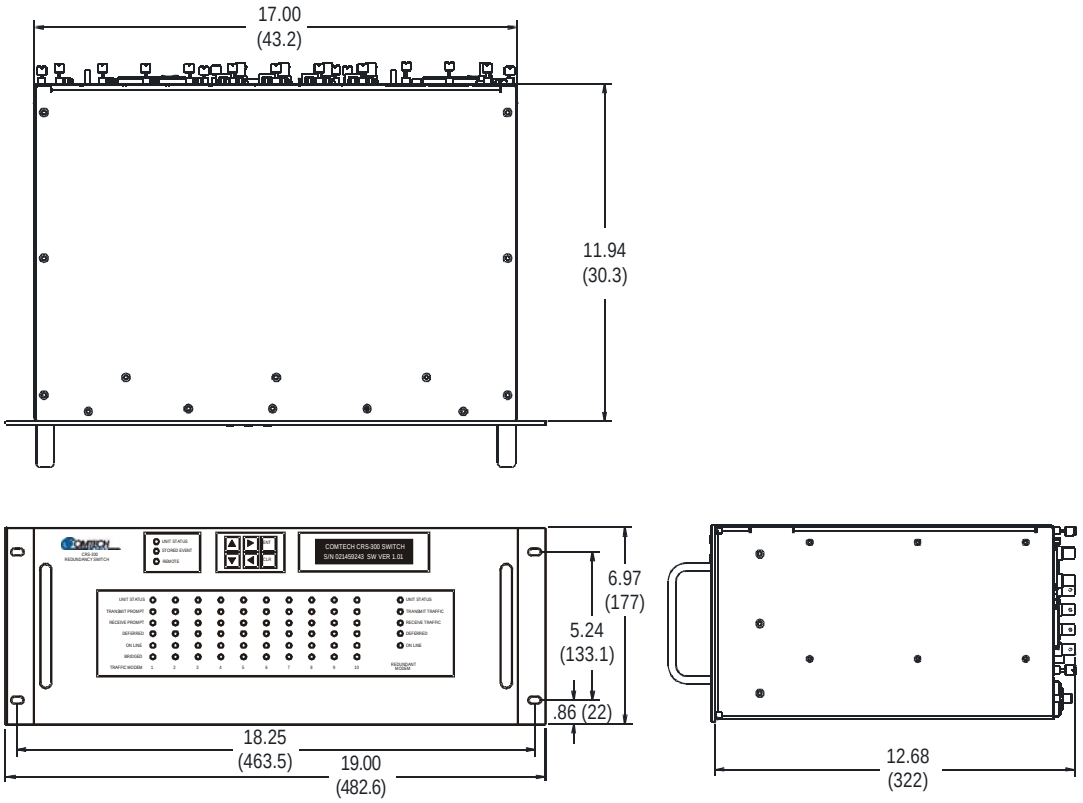


Figure 1-27. CRS-300 Dimensional Envelope

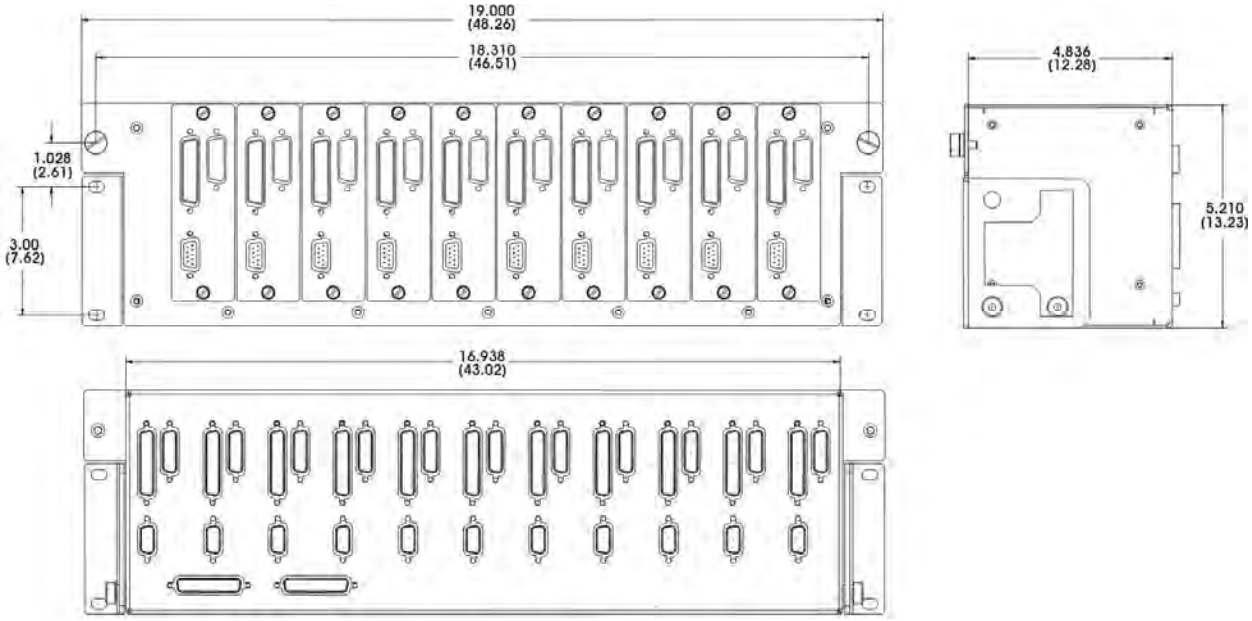


Figure 1-28. CRS-350 Dimensional Envelope

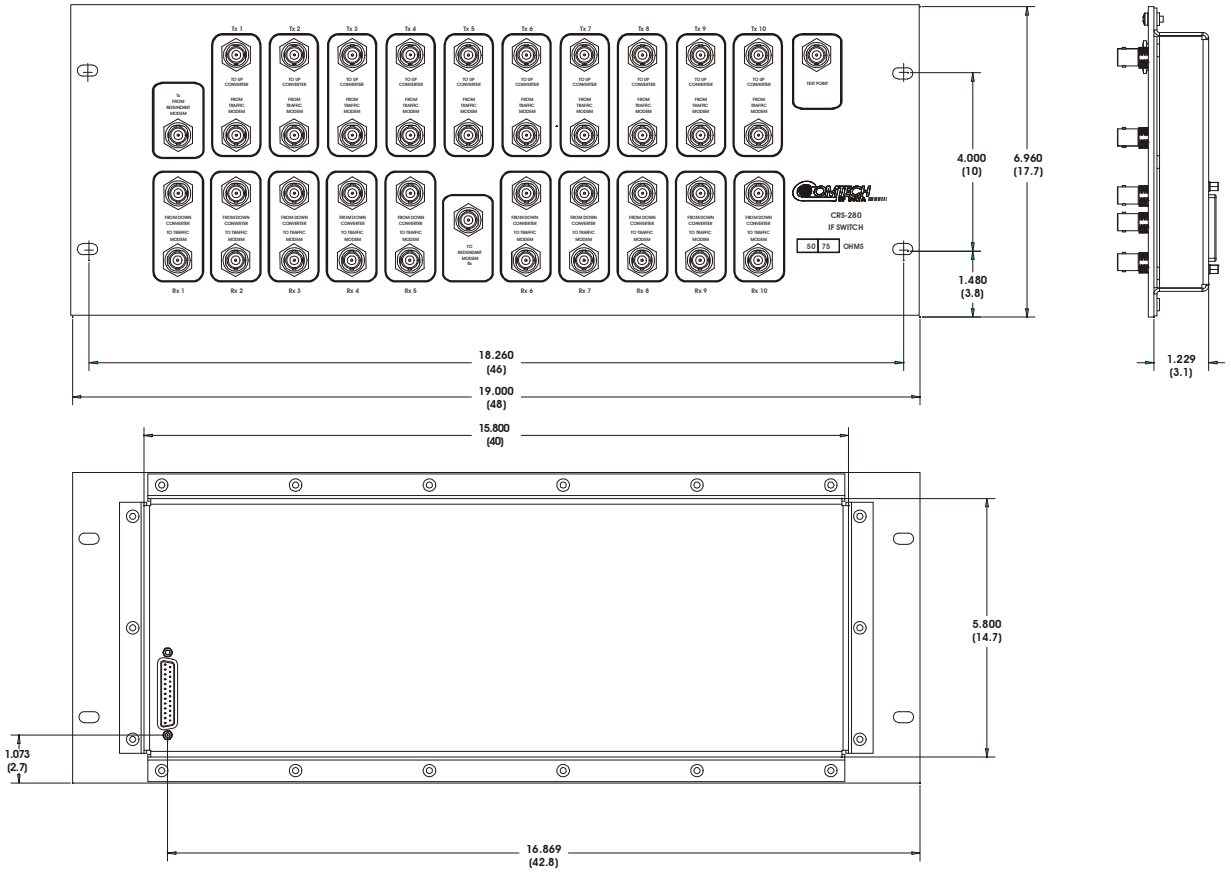


Figure 1-29. CRS-280 (70/140 MHz) Dimensional Envelope

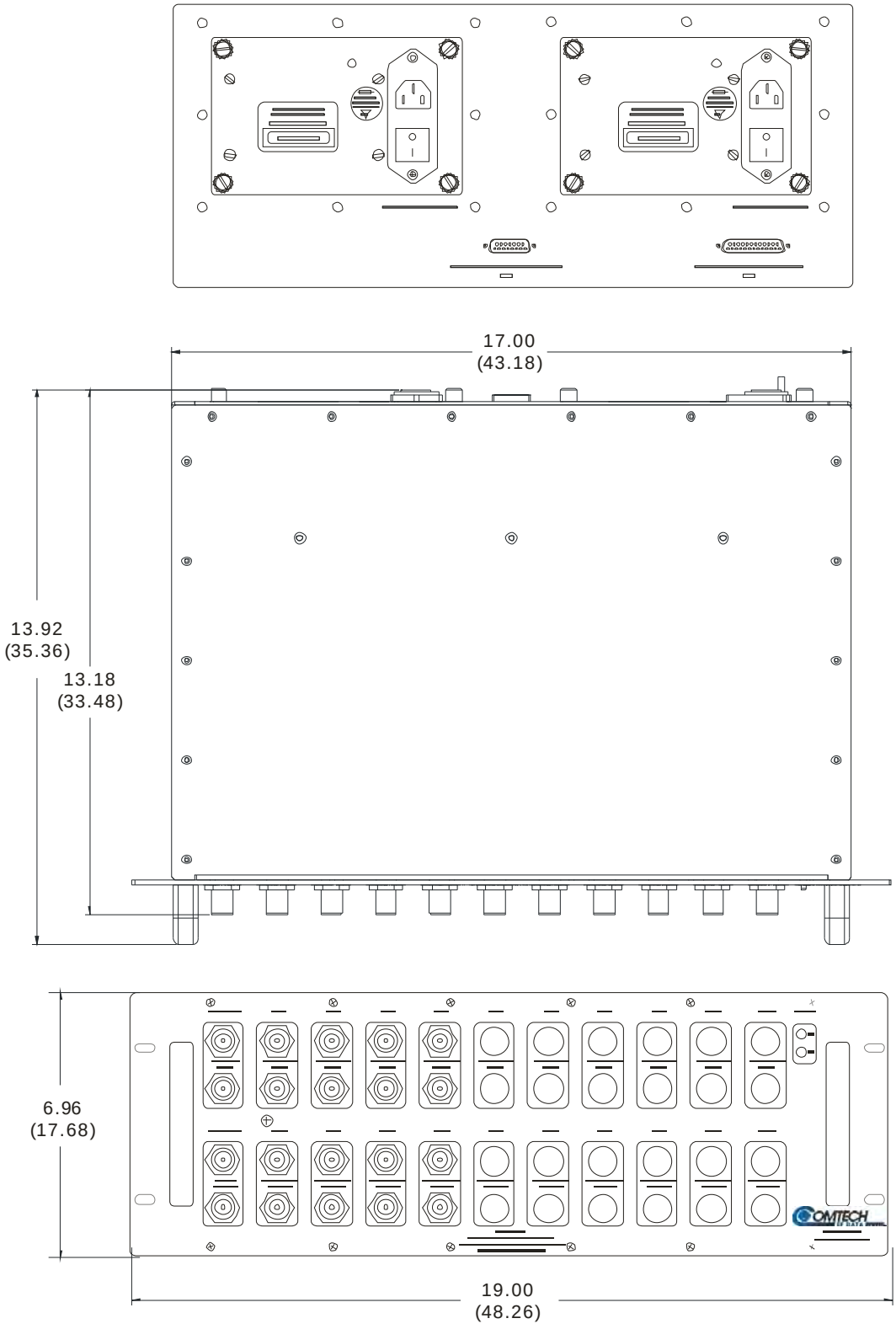


Figure 1-30. CRS-280L (L-Band) Dimensional Envelope

Notes:

Chapter 2. INSTALLATION

2.1 Unpacking and Inspection

Step	Procedure
1	Inspect shipping containers for damage.
2	If shipping containers are damaged, keep them until the contents of the shipment have been carefully inspected and checked for normal operation.
3	Remove the packing list from the outside of the shipping carton.
4	Open the carton and remove the contents.
5	Check the contents against the packing list to verify completeness of the shipment.
6	If damage is evident, contact the carrier and Comtech EF Data immediately and submit a damage report.
7	If the unit needs to be returned to Comtech EF Data, use the original shipping container.

Be sure to keep all shipping materials for the carrier's inspection.

2.2 Rack Mounting

The CRS-300 is constructed as a 4RU-high, rack-mounting chassis. Handles are provided to facilitate removal and placement into a rack.

Mount the Switch in the rack using the mounting holes on the front panel. Use the front panel screw holes **only**. DO NOT install rack slides to the side of the CRS-300 chassis – contact Comtech EF Data if there are questions about rack supports.

Figure 2-1 provides a "cut-away" side view of a typical rack configuration for modems combined with the CRS-300, CRS-280, and CRS-350. The CRS-280 IF Switch can be mounted on the back

or on top of the rack. If using the CRS-280L, refer also to the associated *CRS-280L 1:N Redundancy Switch Installation and Operation Manual* (MN/CRS280L.IOM) for further rack mounting information. The CRS-350 mounts to the back of the rack. The mounting hardware allows the user to hinge the unit down to access the data cables in the rear of the unit to connect the cables to the modems. Mount all Switches and modems in the rack as necessary.

IMPORTANT

Do not allow the internal rack temperature to exceed 50°C (122° F).

It is important to ensure that there is adequate clearance for ventilation in the rack. Since the Switch itself is relatively passive, no additional clearance is needed between it and the nearest modem. In rack systems where there is high heat dissipation, provide forced-air cooling by installing top- or bottom-mounted fans or blowers.

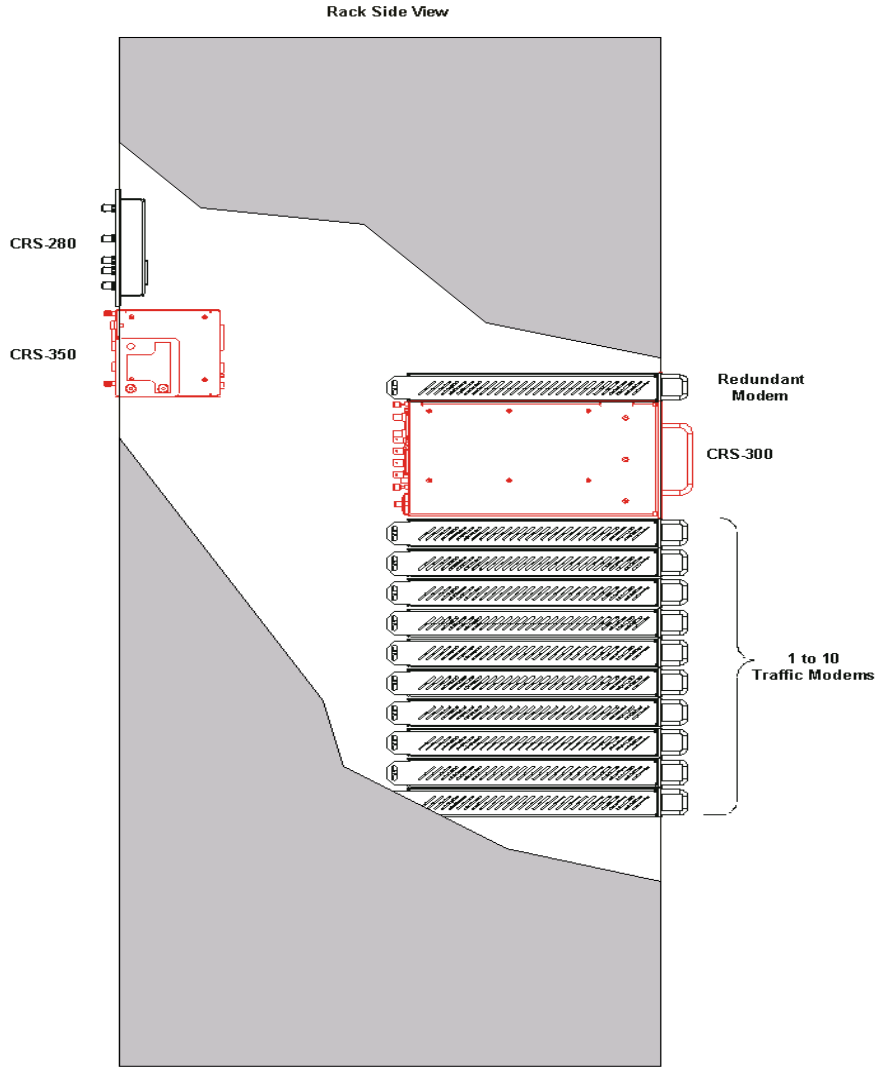


Figure 2-1. Typical Rack Mounting Configuration

Chapter 3. ETHERNET NETWORK CONFIGURATIONS

3.1 Introduction

For operations requiring Ethernet-based terrestrial data handling, it is important to emphasize the need for Users to avoid Ethernet looping connection problems – with or without use of the CRS-300 1:10 Redundancy Switch.

The intent of this chapter is to outline the differing methods for Ethernet-based data handling with the various modems featured throughout this manual. Additionally, this chapter outlines use of the CDM-700 Satellite Modem in redundancy. The CDM-700 provides the added functionality of multiple data type handling simultaneously with Ethernet; i.e., Ethernet & HSSI, Ethernet & G.703, etc.

3.2 Ethernet Routers vs. Switches

Routers and switches allow connection of one or more computers or networked devices to other computers or network devices. Each has two or more connectors, called ports, in which cables connect to other network devices.

An **Ethernet switch** examines the traffic that comes across it, and learns where particular MAC addresses are. An Ethernet switch maintains what is known as a **CAM** (**C**ontent **A**ddressable **M**emory) table, listing the MAC addresses for each switch port. The Ethernet switch uses the CAM table to determine where to forward Ethernet frames. By default, Ethernet switches will update the CAM table automatically; for example, if an Ethernet switch sees traffic from ‘Machine A’ coming in on ‘Port 2’, it now knows that ‘Machine A’ is connected to that port, and that traffic destined for ‘Machine A’ needs to only be sent to that port and not any of the others.

An **Ethernet router** determines where to forward IP traffic based upon the destination IP address and the Route table entries in the router. An Ethernet router can be programmed to understand and route the data it is directed to handle; for example, broadband routers include the ability to "hide" computers behind a type of firewall, which involves slightly modifying the packets of network traffic as they traverse the device. All routers include some kind of user interface for configuring how the router will treat traffic: larger routers include the equivalent of a full-blown programming language to describe how they should operate, as well as the ability to communicate with other routers to describe or determine the best way to direct network traffic from ‘Point A’ to ‘Point B’.

3.3 Ethernet Configuration Examples

This section explains the problems with **Ethernet Networking Loops**, and how to properly design applications architecture for handling **Standard traffic** and **Split-path traffic.** *Standard traffic* is defined as Rx and Tx Ethernet traffic using the same port on the same router or switch, whereas *split-path traffic* is Rx and Tx Ethernet traffic using different ports of the same router or switch.

Each application also has CRS-300 Redundancy applications examples, with subsequent sections in this chapter providing examples of applications architecture designed to handle near-to-far end Ethernet network configurations. This includes:

- **Sect. 3.3.3 Hub-to-Hub with Standard Traffic using Switches**
- **Sect. 3.3.4 Hub-to-Hub with Standard Traffic using Routers**
- **Sect. 3.3.5 Hub-to-Remotes with Standard Traffic using Routers or Switches**
- **Sect. 3.3.6 Hub-to-Remotes, Split-path Traffic using Routers (Point-to-Multipoint)**
- **Sect. 3.3.7 Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)**

3.3.1 Ethernet Network Overview

When placing modems in a network, there are a number of issues that must be addressed – first and foremost on the list of concerns is whether implementation of the switches in the network will cause a **Networking Loop**. This is problematic because a Networking Loop will cause a **Broadcast Storm**, which shuts down the network and causes harm to devices in that network.

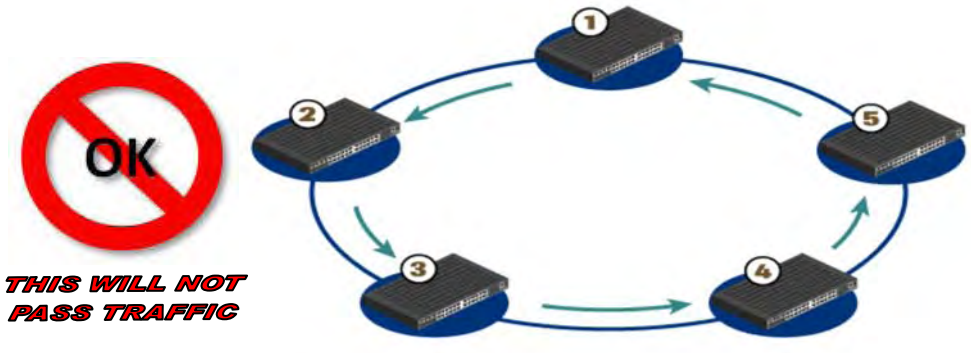


Figure 3-1. Networking Loop with Switches

Figure 3-1 illustrates a Networking Loop with switches. The problem with this configuration is that **'Switch 1'** will send out an ARP request looking for a particular MAC, then each subsequent switch passes along that request until **'Switch 1'** receives it again. At this point, two things could happen:

1. The switch could continue to forward all requests out all ports, creating more and more traffic on the network until there is no bandwidth available and the switch either reboots or locks up.
2. The switch could sense that the ARP request came back to the switch on a different port. The switch could then stop forwarding traffic out the proper port.

Other factors will affect the network: e.g., if the switch is running Spanning Tree Protocol, VLANs, etc.

3.3.2 Ethernet Redundancy with CRS-300

After the customer has determined the best configuration for near-to-far end Ethernet networks, the CRS-300 1:10 Redundancy Switch may now be added to one or both ends of the link(s). Ethernet redundancy using the CRS-300 can be accomplished using a **wired-thru** or **wired-around** configuration.

3.3.2.1 Wired-thru Connection

IMPORTANT

This redundancy approach is the recommended ***and*** preferred ***connection method.***

The wired-thru Ethernet connection on the CRS-300 is the easiest and simplest choice for Ethernet redundancy. This connection method – the same as used on the standard serial data interface – provides a single connection for the User Data Interface and provides simple form-C relays that route the Ethernet connection from the User connection to either the Traffic or Redundant Modem.

3.3.2.2 Wired-around Connection

IMPORTANT

While this redundancy approach is not ***recommended, it can be used after study of the LAN and WAN sides of the IP networks.***

The wired-around Ethernet connection is used with the CRS-300 and the CDM-700 modem where both modem data interface slots are needed; e.g., where one slot is HSSI or G.703 and the other slot is GigE. With the Ethernet slot configured for the wired-around method, this gives full redundancy capability to both data slots. However, care must be taken to ensure there are no Ethernet network loops or connection problems – *this method should* **only** *be used if both modem data slots are used.* In general, the wired-around approach can be used in a hub-to-remotes configuration with standard traffic.

3.3.3 Hub-to-Hub with Standard Traffic using Switches

When connecting two or more "hub-sites" where there are multi-paths between each site, care must be taken to ensure no network loops occur. **Figure 3-2** depicts two hub-sites connected with two or more modems where all the traffic being transmitted and received is on the same LAN/VLAN.

Figure 3-3 shows a simplified version of the Networking Loop. Since there is no router in the network and all the traffic is destined to the same network, routing loops have been created.

As illustrated, two switches have been connected, each with two or more separate connections. This is not how the Ethernet switches were designed to be used, and this configuration will cause a network outage.

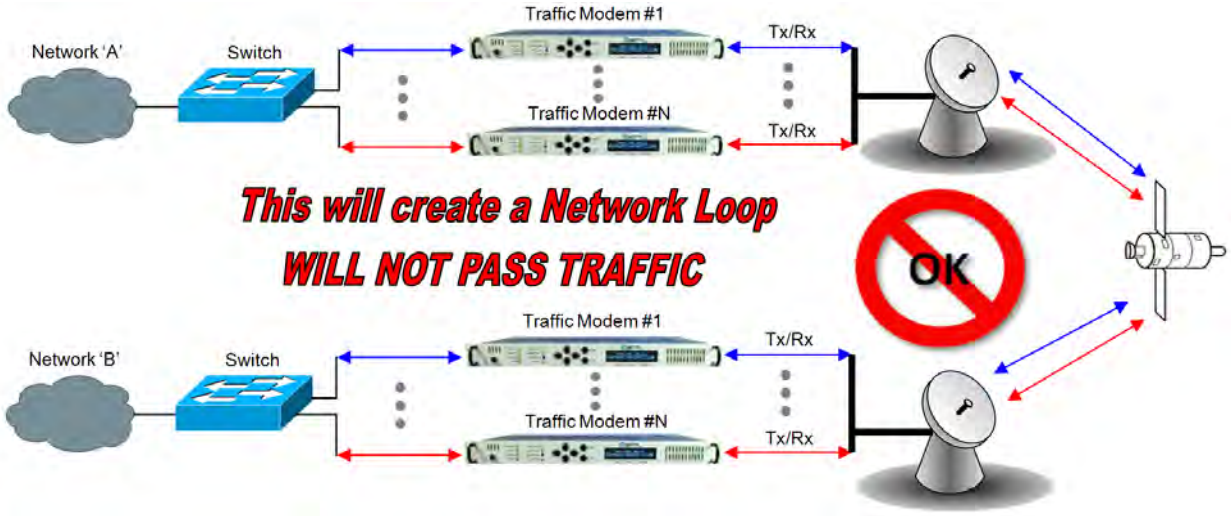


Figure 3-2. Networking Loop Example

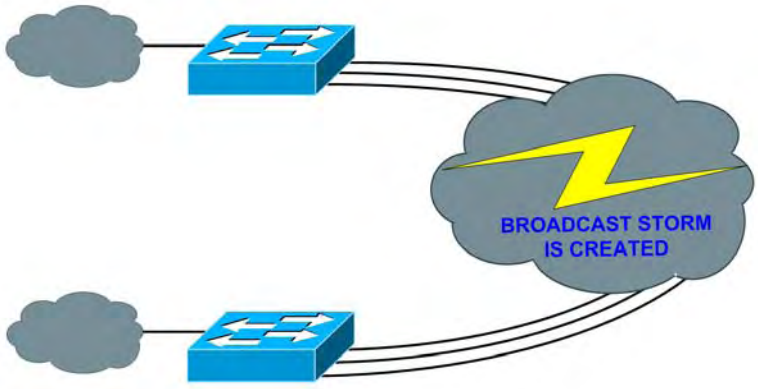


Figure 3-3. Networking Loop Example (Simplified)

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3.3.4 Hub-to-Hub with Standard Traffic using Routers

Figure 3-4 shows two hub-sites connected with standard Ethernet traffic, using routers instead of switches for Ethernet connection. The routers will block the broadcasts coming from the remote network. Therefore, no broadcast storm can be created or the possibility of having a remote MAC on the Hub networks.

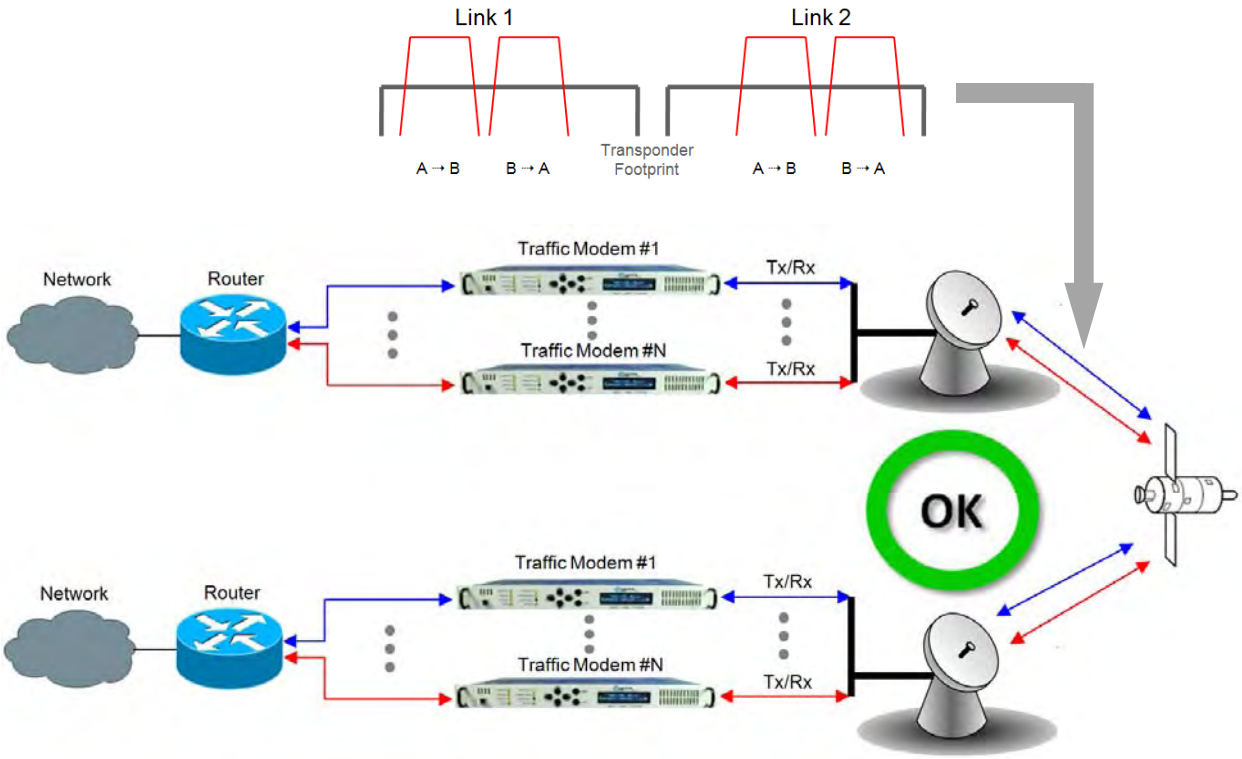


Figure 3-4. Hub-to-Hub with Standard Traffic using Routers

A wired-thru Ethernet redundancy example is shown in **Figure 3-5**. When the CRS-300 1:10 Redundancy Switch "backs-up" a faulted Traffic Modem, the physical port on the router does not change, because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example is shown for the CDM-700 User in **Figure 3-6**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the router needs to change from the Traffic Modem port to the Redundant Modem port. Because of this, special router configuration is required for successful operation – the User may need to consult with the router manufacturer.

IMPORTANT

The wired-around redundancy approach is not ***recommended.***

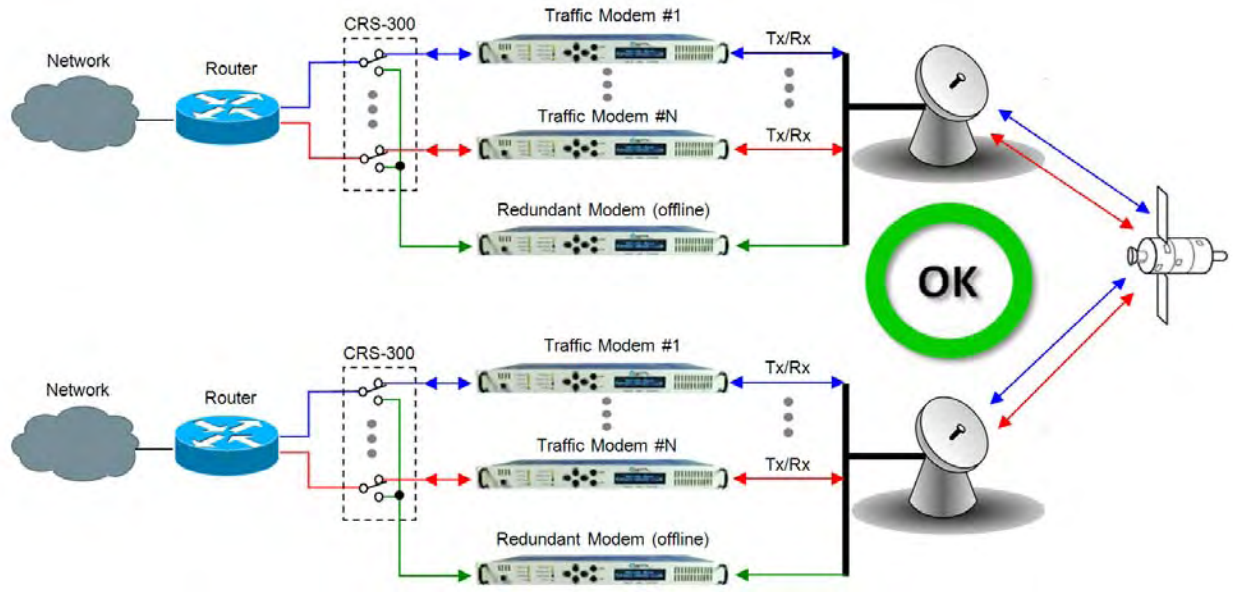


Figure 3-5. Wired-thru for Hub-to-Hub with Standard Traffic using Routers

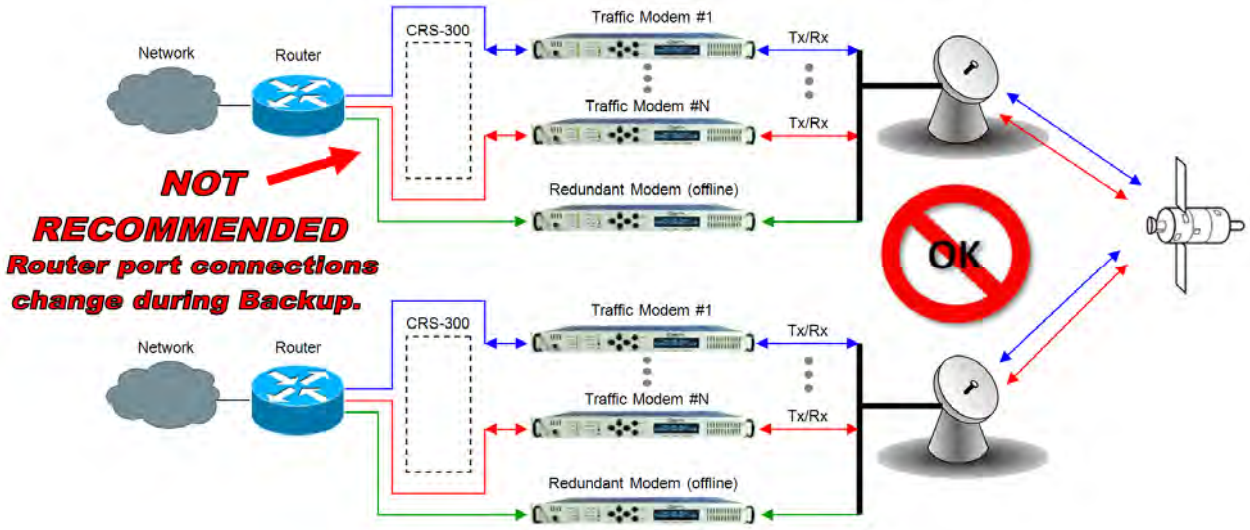


Figure 3-6. Wired-around for Hub-to-Hub with Standard Traffic using Routers

3.3.5 Hub-to-Remotes with Standard Traffic using Routers or Switches

Figure 3-7 shows hub-to-remotes configuration with standard Ethernet traffic using routers or switches. The routers/switches will block broadcasts coming from the hub and remote networks. Therefore, no broadcast storm can be created or the possibility of having a remote MAC on the Hub networks.

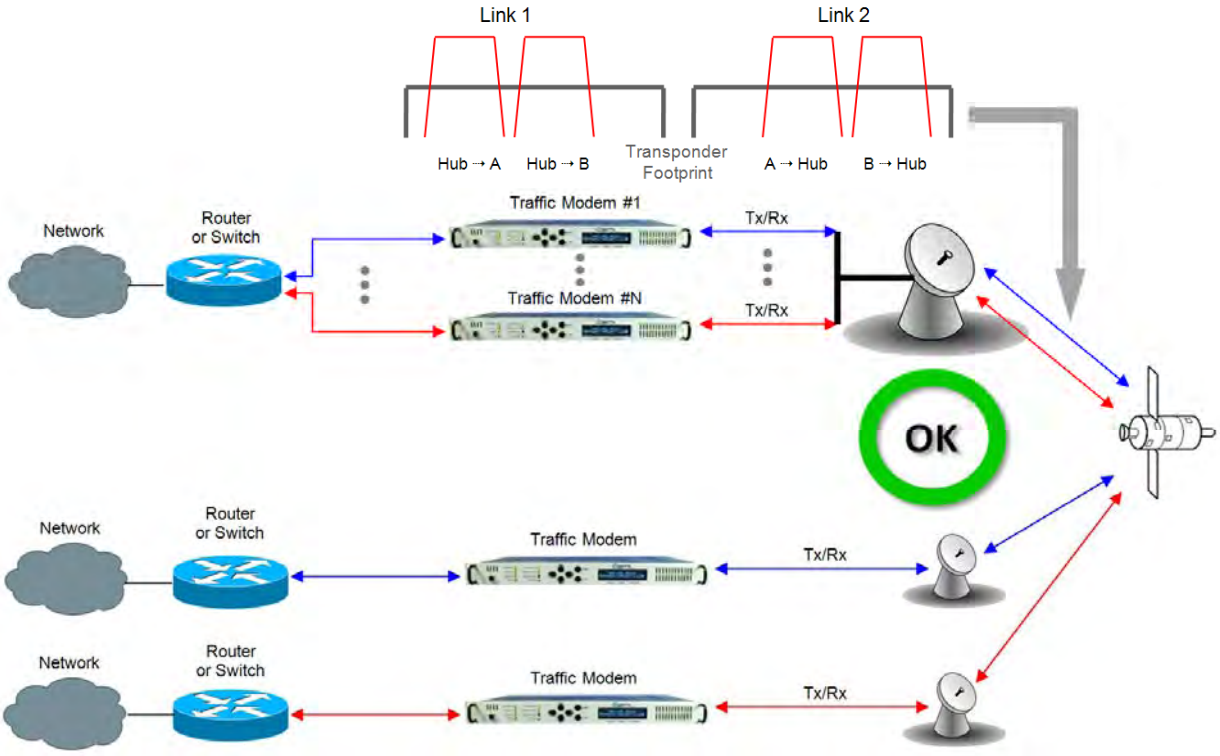


Figure 3-7. Hub-to-Remotes with Standard Traffic using Routers or Switches

A wired-thru Ethernet redundancy example is shown in **Figure 3-8**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port, (on the router) does not change because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example for the CDM-700 User is shown **Figure 3-9**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the Dwitch will learn the new MAC address of the redundant unit and traffic will be passed again. This type of architecture will slow down the switching time, because the Switch will need to re-learn the correct port connection.

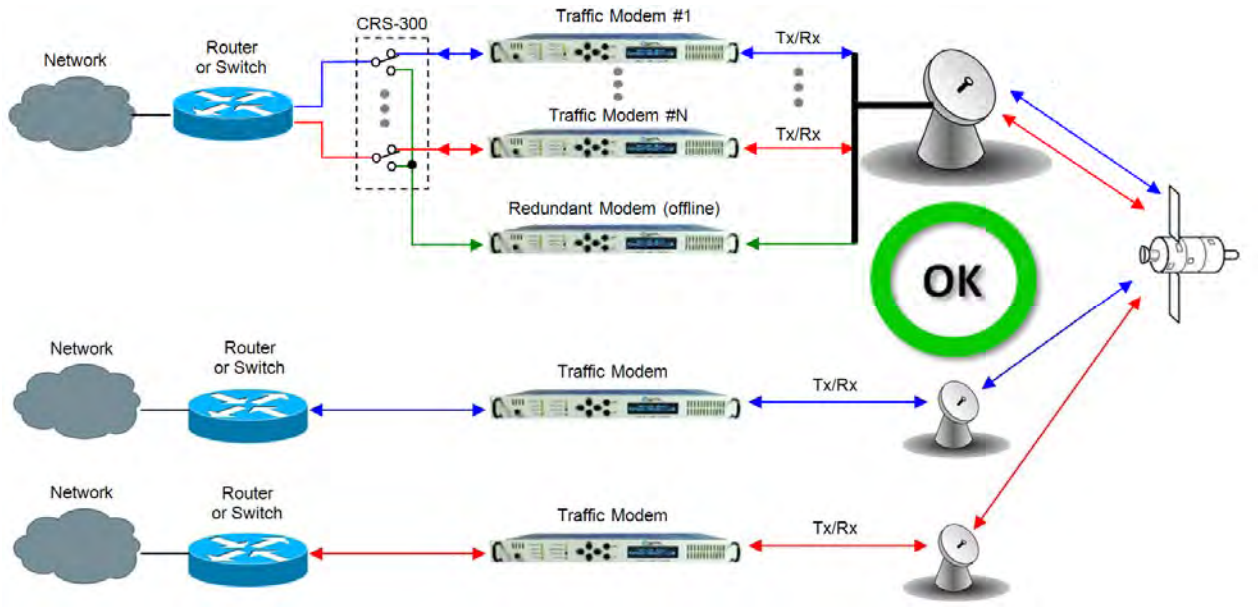


Figure 3-8. Wired-thru for Hub-to-Remotes with Standard Traffic using Routers or Switches

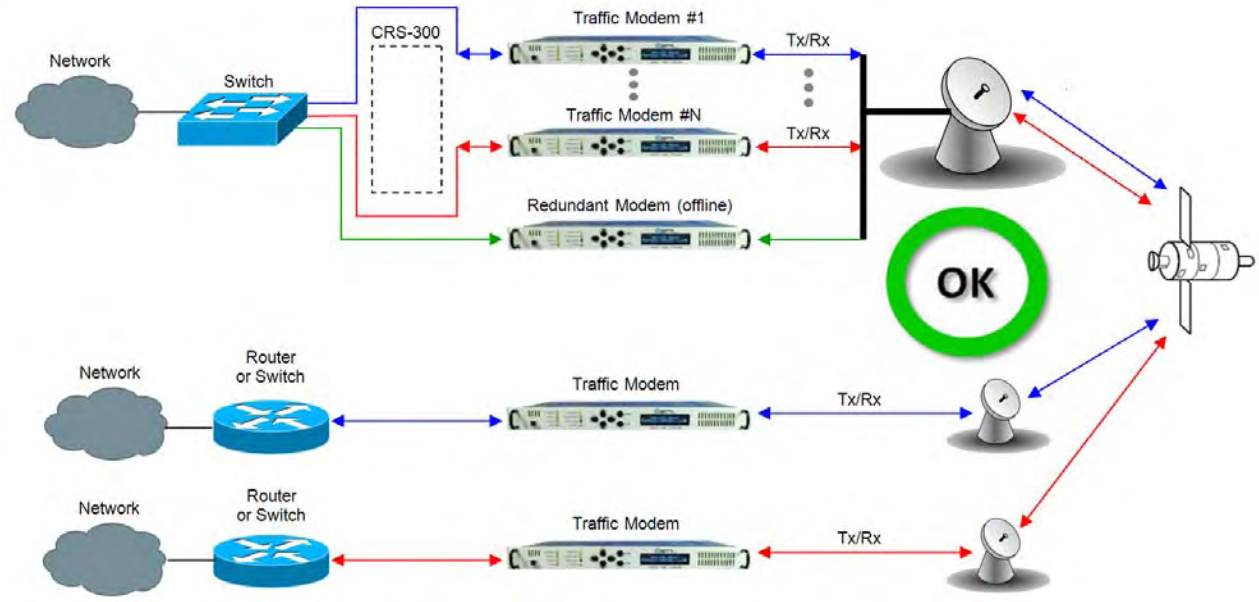


Figure 3-9. Wired-around for Hub-to-Remotes with Standard Traffic using Routers or Switches

3.3.6 Hub-to-Remotes, Split-path Traffic using Routers (Point-to-Multipoint)

Figure 3-10 shows hub-to-remotes configuration with standard and split-path Ethernet traffic, using routers. A Static ARP Entry is needed in the switch so that routing of the Tx side of the modems will be on the correct port of the router. For example, the Rx side of the Ethernet connection for **'Traffic Modem #N'** comes in the bottom port of the Router, but the Tx Ethernet connection must be connected through the same port as **'Traffic Modem #1'**, as shown in this figure.

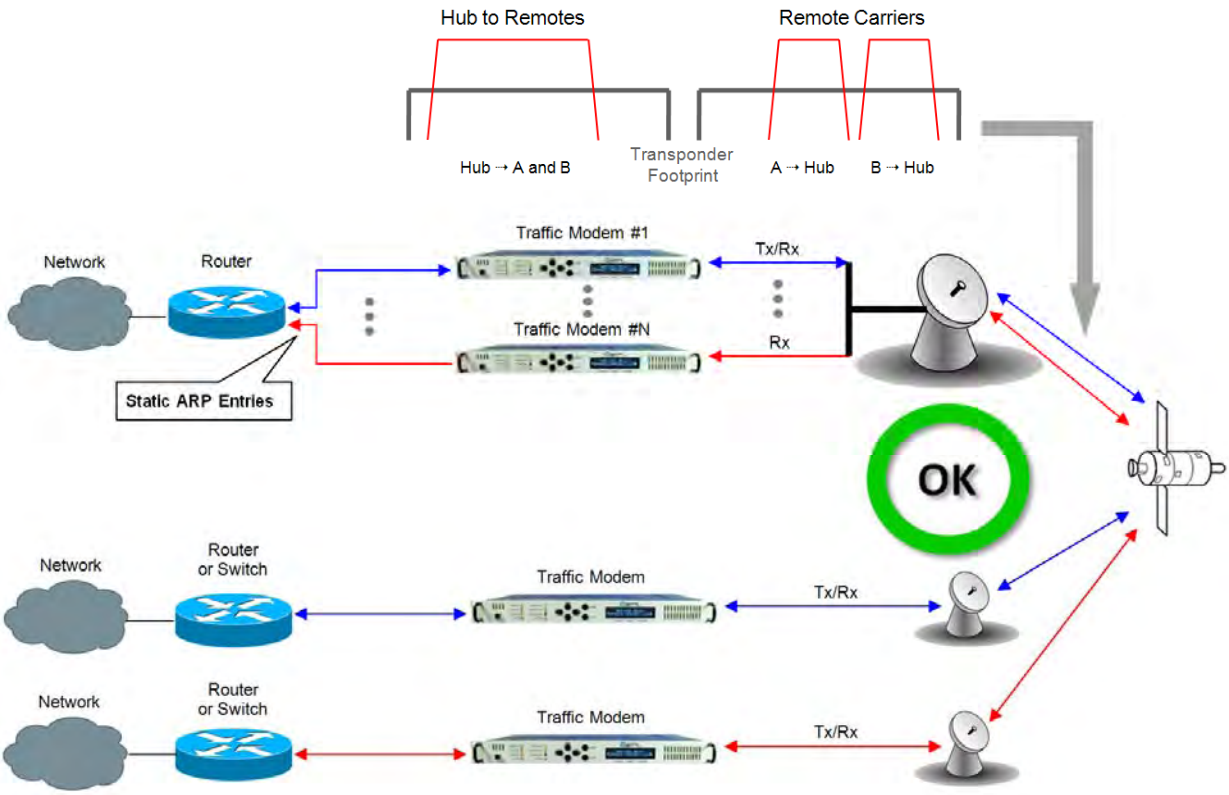


Figure 3-10. Point-to-Multipoint using Routers

A wired-thru Ethernet redundancy example is shown in **Figure 3-11.** When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the router does not change, because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example is shown for the CDM-700 User in **Figure 3-12**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the router needs to change from the Traffic Modem port to the Redundant Modem port. Because of this, special router configuration is required for successful operation – the User may need to consult with the router manufacturer.

IMPORTANT

The wired-around redundancy approach is not ***recommended.***

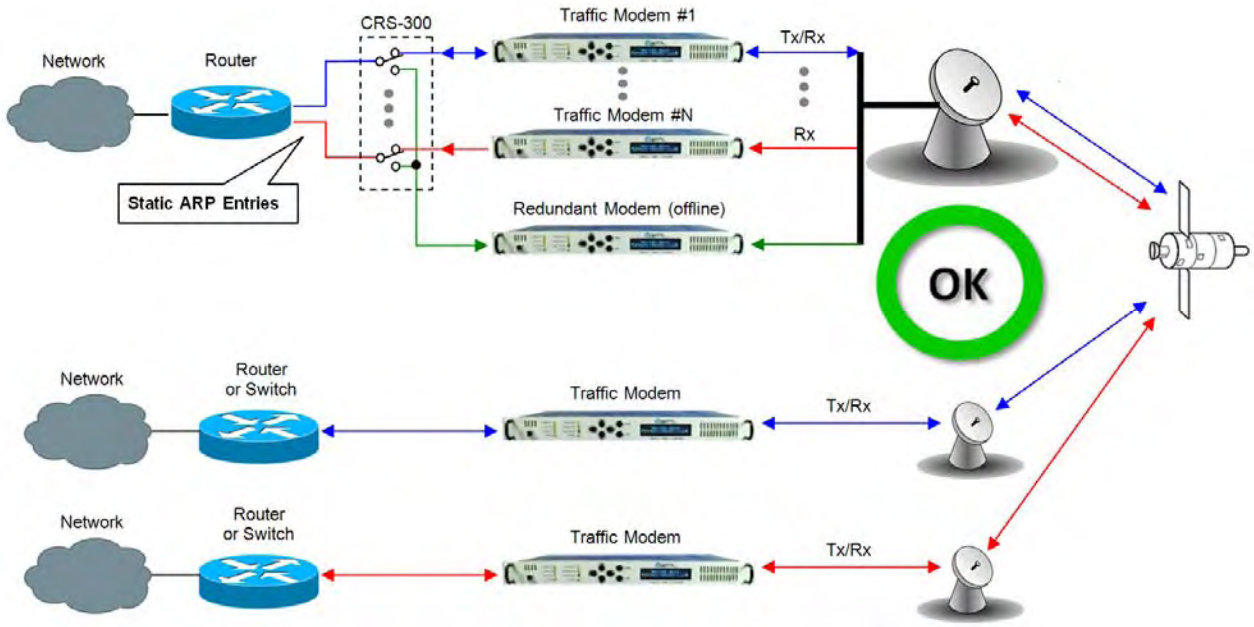


Figure 3-11. Wired-thru for Point-to-Multipoint with Routers

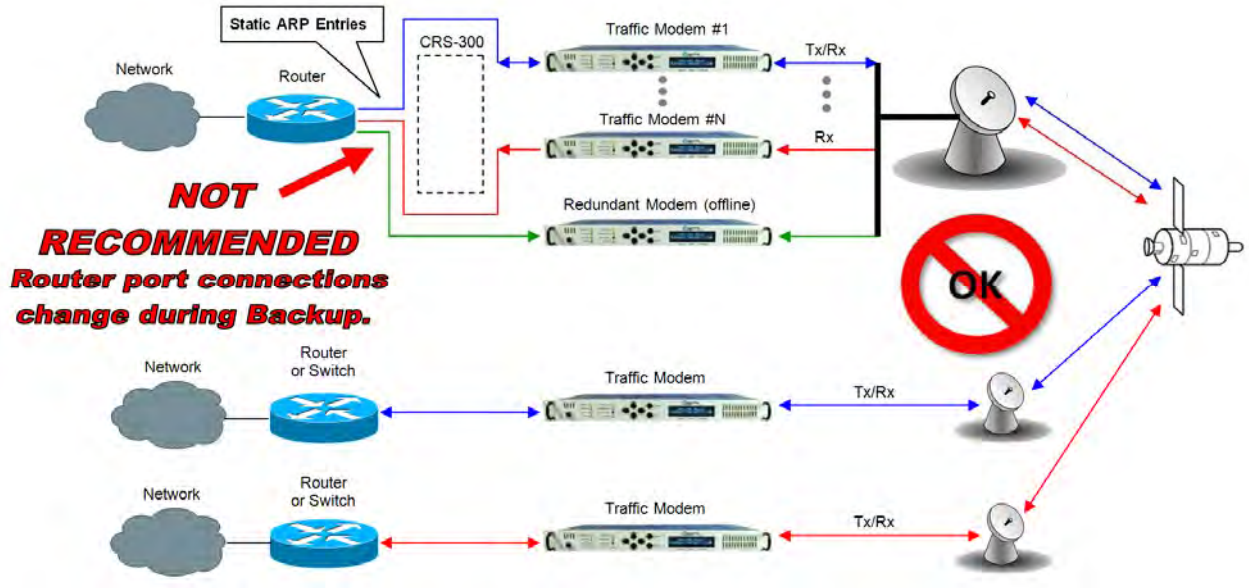


Figure 3-12. Wired-around for Point-to-Multipoint with Routers

3.3.7 Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

With switches used, the hub and remote are on the same subnet as shown in **Figure 3-13**, meaning that broadcasts will be allowed to transverse the network. Learning Mode must be disabled on the Hub Tx/Rx modem, because if a computer on the remote sends a broadcast out to the Hub, the modem learns that MAC is local – when in fact it is not.

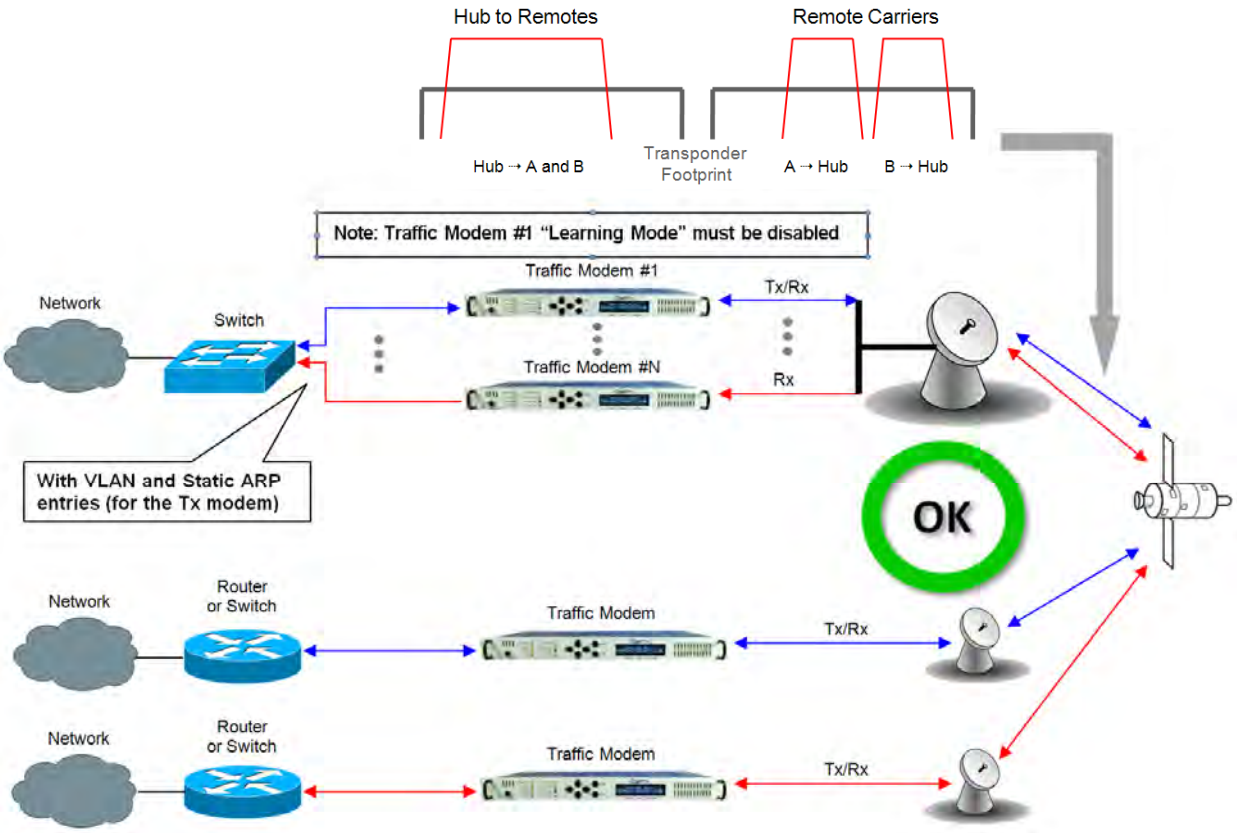


Figure 3-13. Point-to-Multipoint using Switches

A wired-thru Ethernet redundancy example is shown in **Figure 3-14**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the Switch does not change, because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example is shown for the CDM-700 User in **Figure 3-15**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the Switch will learn the new MAC address of the redundant unit and traffic will be passed again. This type of architecture will slow down the switching time, because the Switch will need to re-learn the correct port connection.

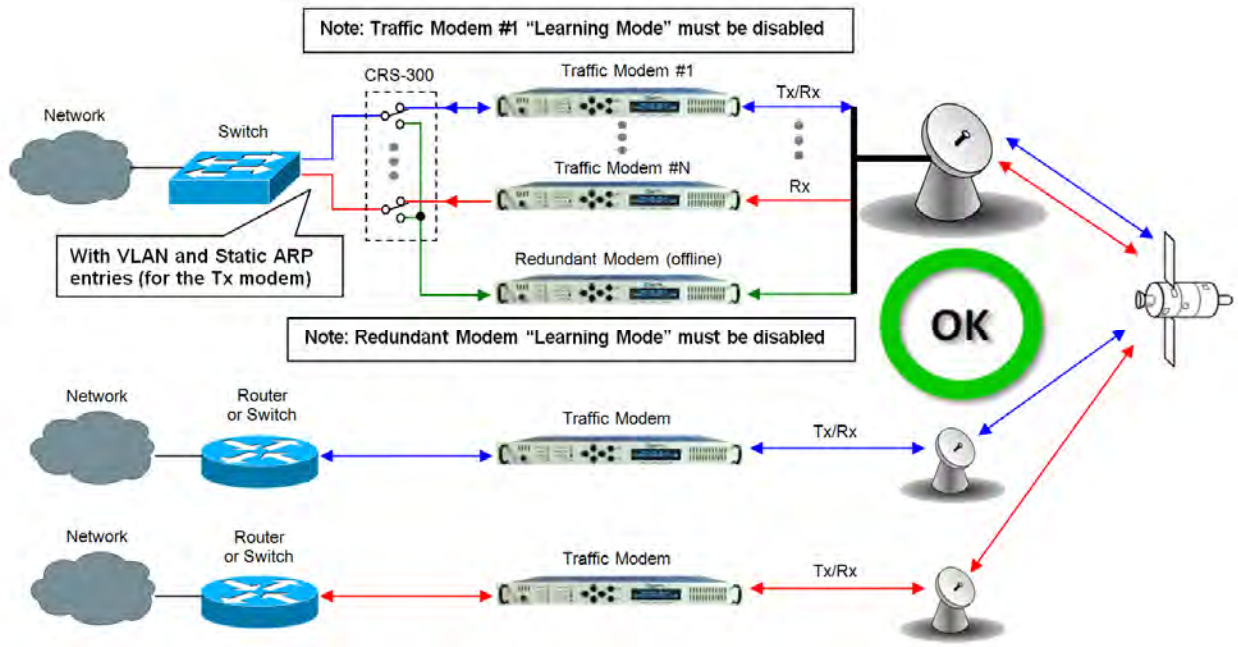


Figure 3-14. Wired-thru, Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

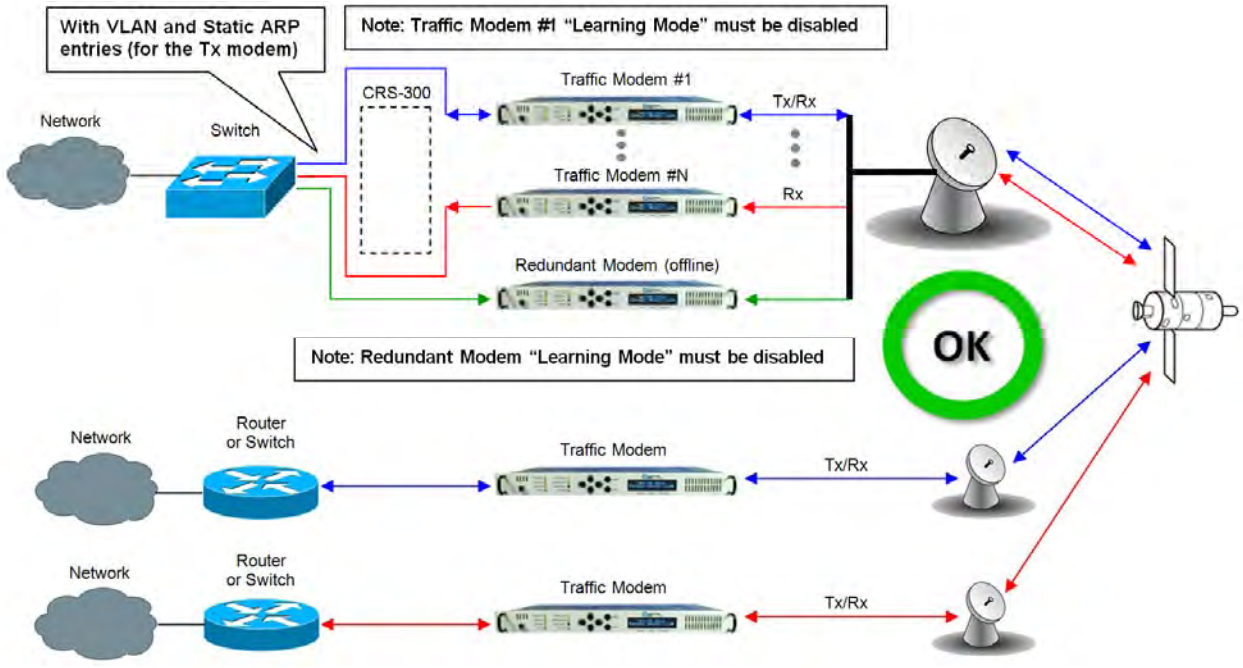


Figure 3-15. Wired-around, Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

Notes:

Chapter 4.
CABLES AND CONNECTIONS

4.1 Overview

All cables for connecting the CRS-300 1:10 Redundancy Switch to the modems or within the system are available from Comtech EF Data. These cables can be ordered at the same time the order is placed for the CRS-300.

If fabricated by the customer, the cables required between each modem and Switch plug-in RMI or TMI card should be of shielded, twisted-pair construction, with the grounded shield bonded to the back shell. All data cables should be wired correctly using the pinout and connection information as specified in **Appendix A. CABLE DRAWINGS**.

Leave the Switch and all modems powered off until all connections are ready.

Once the Switch and all the modems have been mounted, the User must properly attach all required cabling. In most cases the modem accepts the male end of the cable, while connectors on the RMI or TMI card accepts the female end of the cable in the section of the card labeled "Modem Interface."

Refer to the subsections in **Chapter 1.4 Description of CRS-300 Features** for detailed information on these interfaces. Illustrations featured throughout this chapter provide cabling configuration examples for RMI or TMI interfaces – i.e., the interconnection of a Redundant Modem to a Switch RMI card, or the interconnection between a Switch TMI card and a Traffic Modem. The step-by-step process for connecting a variety of Switch and modem configurations is outlined in the following chapter sections:

- **Sect. 4.2 Switch-to-Switch Connections**
- **Sect. 4.3 CDM-570/570L Modem Connections**
- **Sect. 4.4 CDM-600/600L Modem Connections**
- **Sect. 4.5 CDM-625 Modem Connections**
- **Sect. 4.6 CDM-Qx/QxL Modem Connections**
- **Sect. 4.7 CDM-700 Modem Connections**
- **Sect. 4.8 CDM-710 Modem Connections**
- **Sect. 4.9 CDM-710G Modem Connections**
- **Sect. 4.10 SLM-5650/5650A Modem Connections**
- **Sect. 4.11 IF Cable Connections**

Notes:

4.2 Switch-to-Switch Connections

- **CRS-300 to CRS-280/280L Connection**
- **CRS-300 to CRS-350 Connection**
- **CRS-300 to CRS-350 to CRS-280/280L Connection**

4.2 Switch-to-Switch Connections

If the User's redundancy system requires the Comtech EF Data CRS-280 (70/140 MHz) IF, CRS-280L (L-Band) IF, and/or CRS-350 Engineering Service Channel (ESC) Switch (used only with the CDM-600/600L, CDM-625, or SLM-5650/5650A), Control/Data Cable CA/WR0066 is needed to connect the Switches. Each CRS-280/280L and CRS-350 is supplied with this cable for connection to the associated Switch control unit.

The following sections outline the switch-to-switch cable connections between the CRS-300, CRS-350, and the CRS-280/280L.

4.2.1 CRS-300 to CRS-280/280L Connection

Refer to **Figure 4-1** and **Figure 4-2** to connect and secure the CA/WR0066 cable between the CRS-300 and the CRS-280/280L as follows:

- DB-25M connector labeled "IF Switch Control" on the CRS-300's CRS-230 System Controller, to
- DB-25F connector on the rear panel of the CRS-280/280L.

4.2.2 CRS-300 to CRS-350 Connection

Refer to **Figure 4-3** to connect and secure the CA/WR0066 cable between the CRS-300 and the CRS-350 as follows:

- DB-25M connector labeled "IF Switch Control" on the CRS-300's CRS-230 System Controller, to
- DB-25F connector on the rear panel of the CRS-350.

4.2.3 CRS-300 to CRS-350 and CRS-280/280L Connection

Refer to **Figure 4-4** or **Figure 4-5** to first connect and secure the CA/WR0066 cable between the CRS-300 and CRS-350 as follows:

- DB-25M connector labeled "IF Switch Control" on the CRS-300's CRS-230 System Controller, to
- DB-25F connector on the rear panel of the CRS-350.

Next, connect and secure the second 25-pin CA/WR0066 cable between the CRS-350 and CRS-280/280L as follows:

- DB-25M connector on the CRS-350, to
- DB-25F connector on the rear panel of the CRS-280/280L.

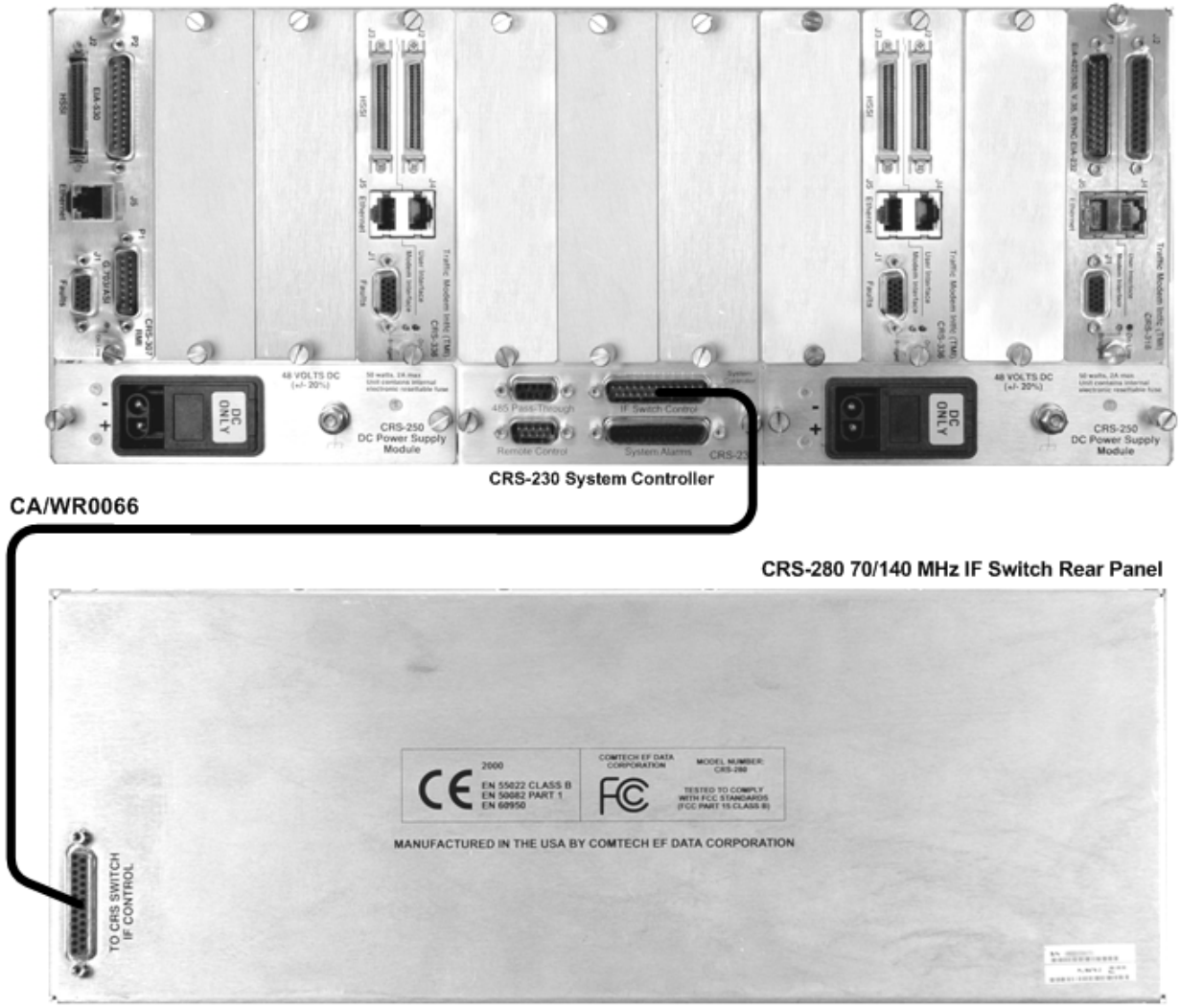

CRS-230 System Controller
CA/WR0066
CRS-280 70/140 MHz IF Switch Rear Panel
TO CRS SWITCH IF CONTROL
MANUFACTURED IN THE USA BY COMTECH EF DATA CORPORATION

Figure 4-1. Control Cable Connection Example for CRS-300 → CRS-280

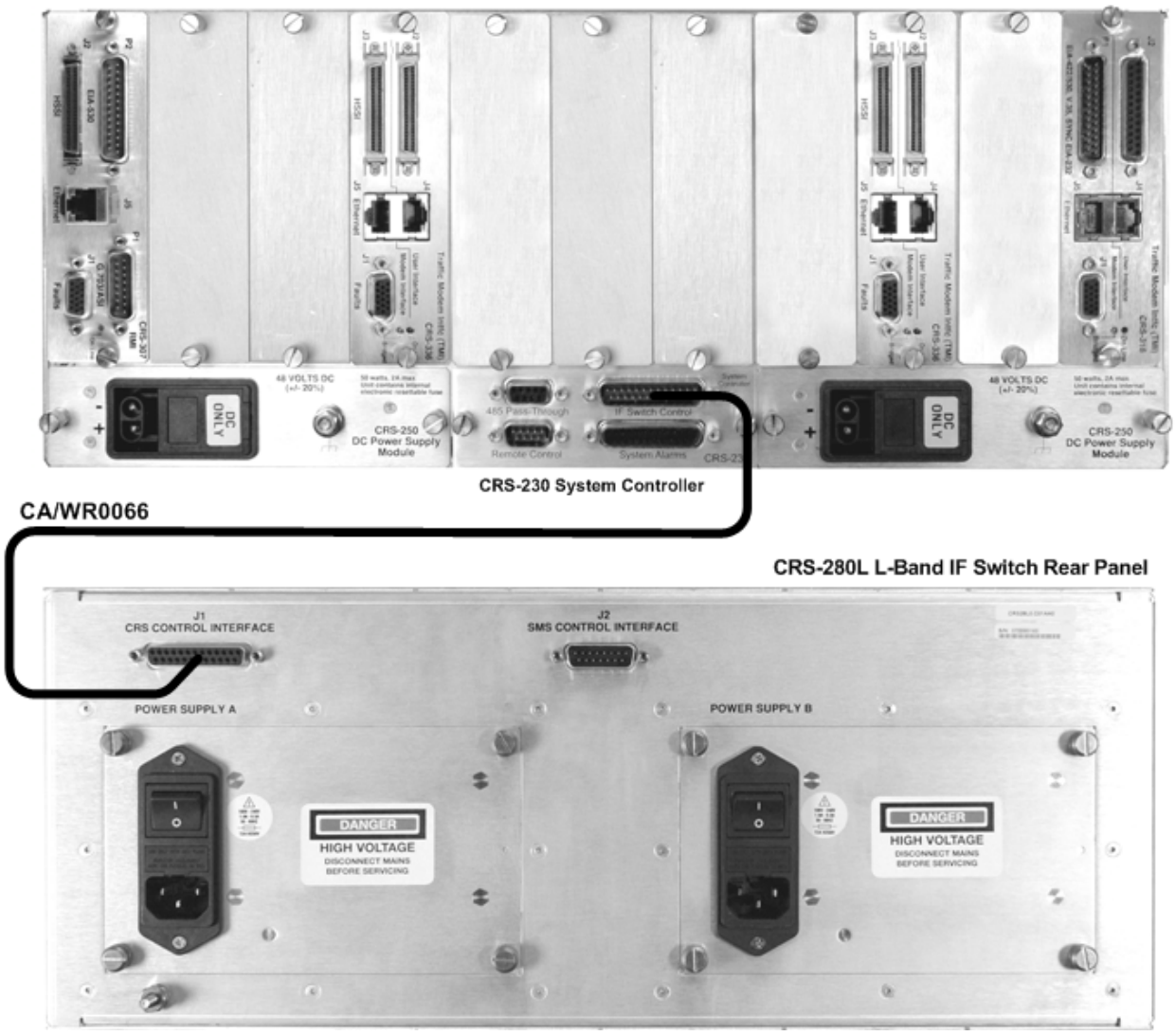


Figure 4-2. Control Cable Connection Example for CRS-300 →CRS-280L

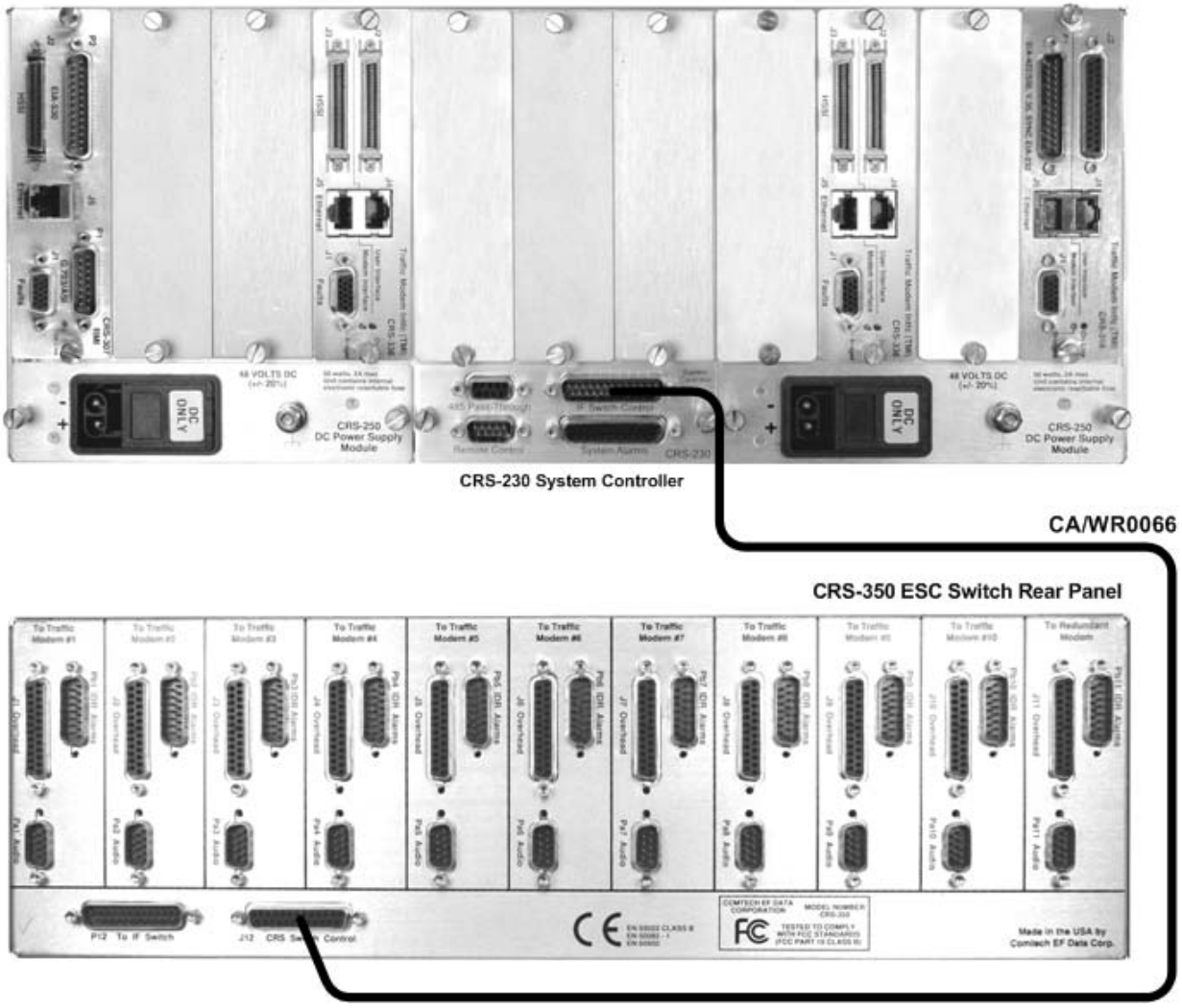


Figure 4-3. Control Cable Connection Example for CRS-300 → CRS-350

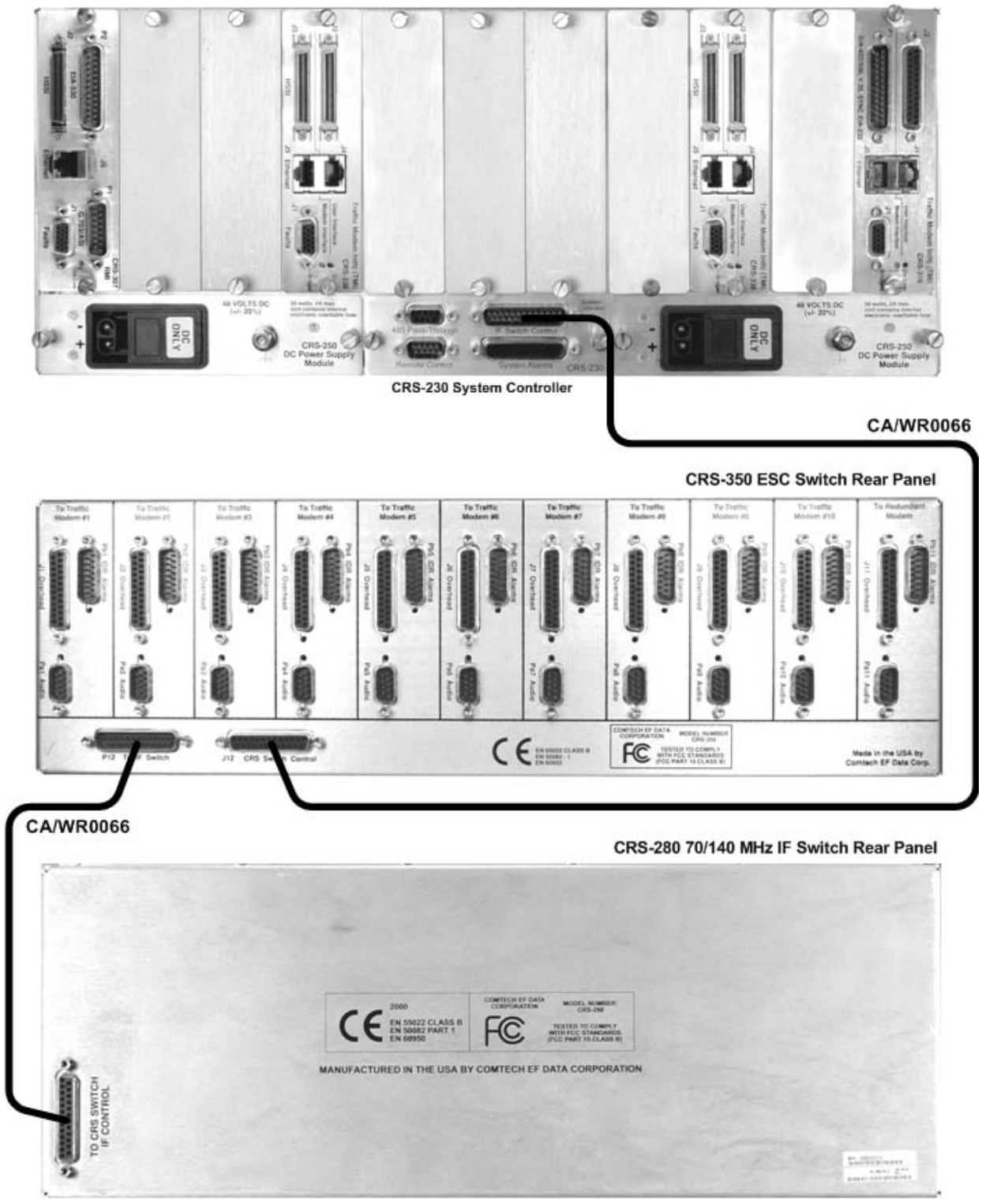

CRS-230 System Controller
CA/WR0066
CRS-350 ESC Switch Rear Panel
CA/WR0066
CRS-280 70/140 MHz IF Switch Rear Panel
MANUFACTURED IN THE USA BY COMTECH EF DATA CORPORATION
TO CRS SWITCH IF CONTROL

Figure 4-4. Control Cable Connection Example for CRS-300 → CRS-350 → CRS-280

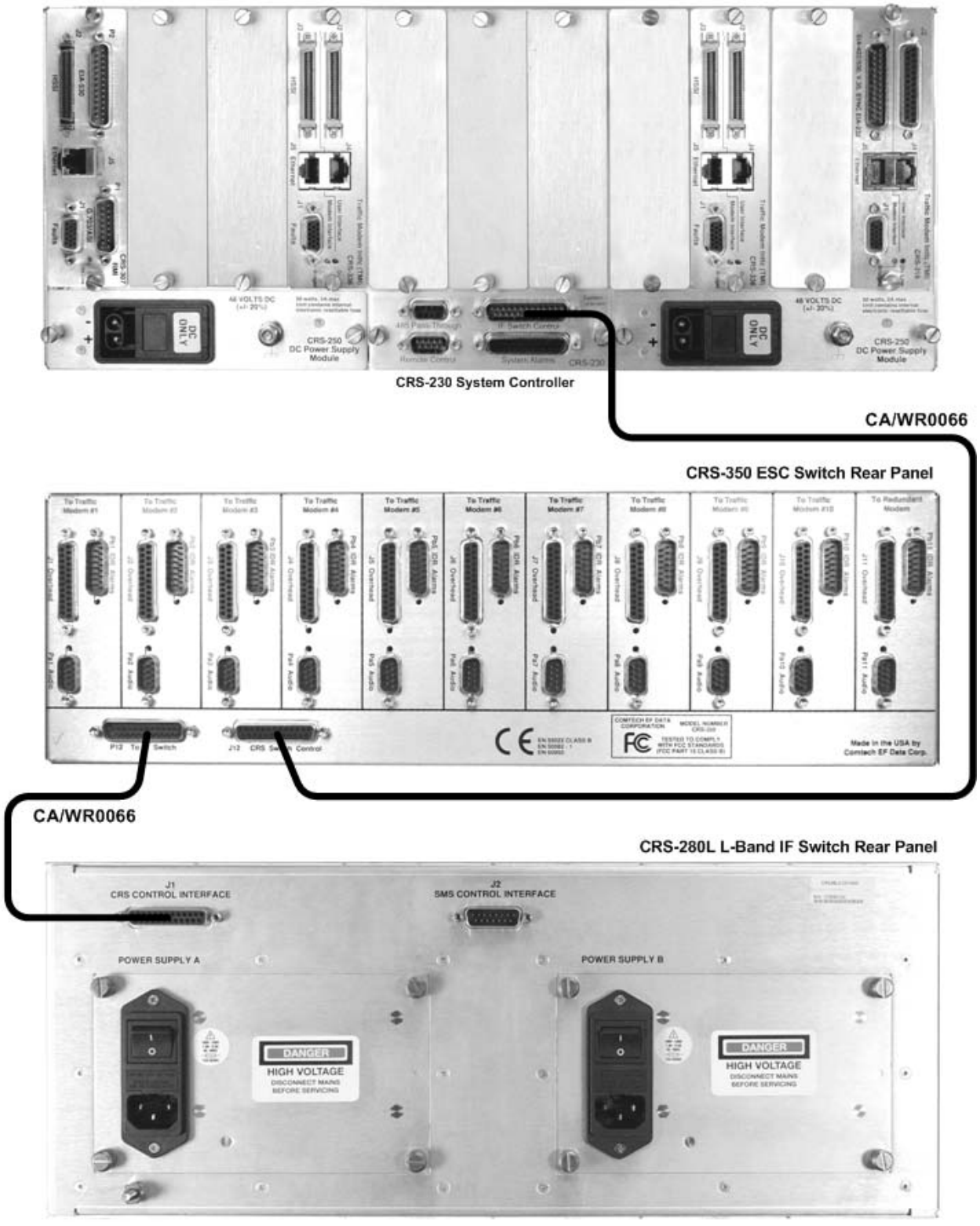


Figure 4-5. Control Cable Connection Example for CRS-300 → CRS-350 → CRS-280L

Notes:

4.3 CDM-570/570L Modem Connections

- **Control and Data Connections – CRS-300 to Modems**
- **User Data Connections – CRS-300 to User**

4.3 CDM-570/570L Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing Traffic Modem. The cabling, power-up sequence must be correct to avoid contention in the system from the modem Tx carrier. This sequence is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

IMPORTANT

Traffic modems with differing data types can all be supported by the Redundant Modem.

4.3.1 Control and Data Connections – CRS-300 to Modems

The 25-pin Control/Data Cable CA/WR0066 provides the EIA-422/232 traffic data path and serial communication path between the Switch and the modems, and is therefore always required even if the data type is G.703.

IMPORTANT

Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for EIA-422 with RTS/CTS, DTR/DSR signal using the CRS-320 (obsolete) or CRS-340 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information.

Refer to **Figure 4-6** to connect and secure the CA/WR0066 cables between each CDM-570/570L and the CRS-300 as follows:

- DB-25M connector labeled "P1" on the RMI or TMI(s), to
- DB-25F connectors labeled "Data Interface" on the CDM-570/570Ls.

If G.703 is the traffic data type, also connect and secure the Data Cable CA/WR11999-6, used for either Balanced or Unbalanced G.703 data, as follows:

- DB-15M connector labeled "P2" on the RMI or TMI(s), to
- DB-15F connectors labeled "Balanced E1/T1" on the CDM-570/570Ls.

4.3.2 User Data Connections – CRS-300 to User

The User's traffic data from multiplexing equipment or a test data generator should connect to the connectors labeled "User Data Interface" on the TMI(s). This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

IMPORTANT

1. ***Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.***
2. ***Ensure that the correct operation for Balanced or Unbalanced G.703 data is configured on the modem.***

For T1/E1 operation, the optional CN-0000268 T1/E1 Adapter (illustrated in **Figure A-32** in **Appendix A. CABLE DRAWINGS**) may be purchased from Comtech EF Data to adapt the Balanced G.703 DB-15F connector on the User data side of the TMI to a RJ-48 female connection.

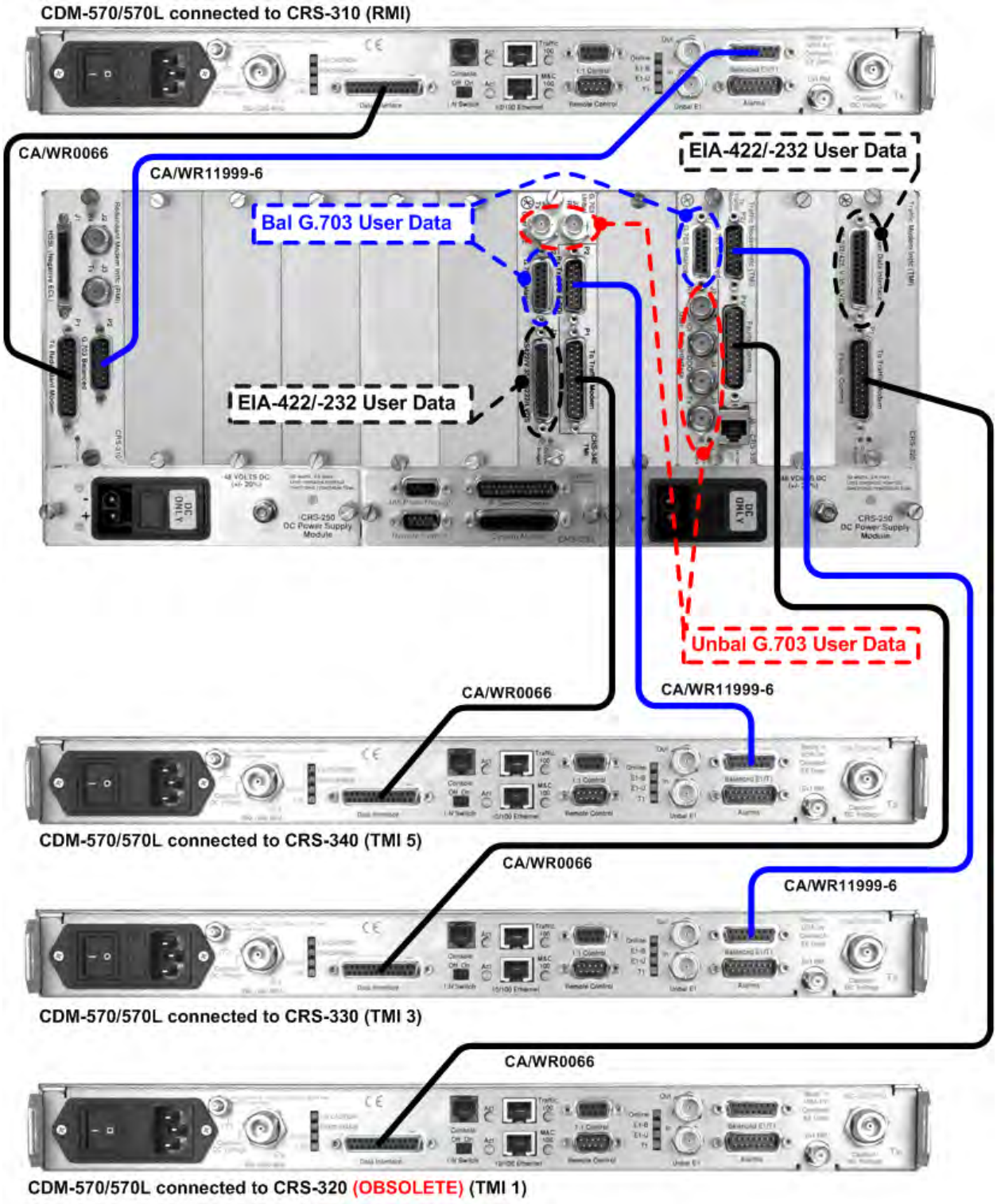


Figure 4-6. Data Cable Connection Example – CRS-300 to CDM-570/570L
(Connections shown for RMI and TMIs 1, 3, and 5 only)

Notes:

4.4 CDM-600/600L Modem Connections

- **Control and Data Connections – CRS-300 to Modems**
- **User Data Connections – CRS-300 to User**
- **ESC Data Connections – CRS-350 to Modems**
- **User ESC Data Connections – CRS-350 to User**

IMPORTANT

The CDM-625 Open Network Satellite Modem, with its available CDM-600 Emulator Mode, serves as an operationally transparent replacement unit for the CDM-600/600L Open Network Satellite Modems.

4.4 CDM-600/600L Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing traffic. The cabling and power-up sequence must be correct to avoid contention in the system from the modem Tx carrier. This sequence is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

IMPORTANT

Traffic modems with differing data types can all be supported by the Redundant Modem.

4.4.1 Control and Data Connections – CRS-300 to Modems

The 25-pin Control/Data Cable CA/WR0066 provides the EIA-422/-232/LVDS traffic data path and serial communication path between the Switch and the modems, and is therefore always required even if the data type is G.703.

IMPORTANT

Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for EIA-422 with RTS/CTS, DTR/DSR signals using the CRS-340 TMI, and for HSSI with CA/TA signals using the CRS-370 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information.

Refer to **Figure 4-7** to connect and secure the CA/WR0066 cables between each CDM-600/600L and the CRS-300 as follows:

- DB-25M connector labeled “P1” on the RMI or TMI(s), to
- DB-25F connector labeled “P3B Data Interface” on the CDM-600/600Ls.

If G.703 is the traffic data type, also connect the CA/WR9038-6 data cable, used for either Balanced or Unbalanced G.703 data, as follows:

- DB-15M connector labeled “P2” on the RMI or TMI(s), to
- DB-15F connectors labeled “P7 Balanced G.703” on the CDM-600/600Ls.

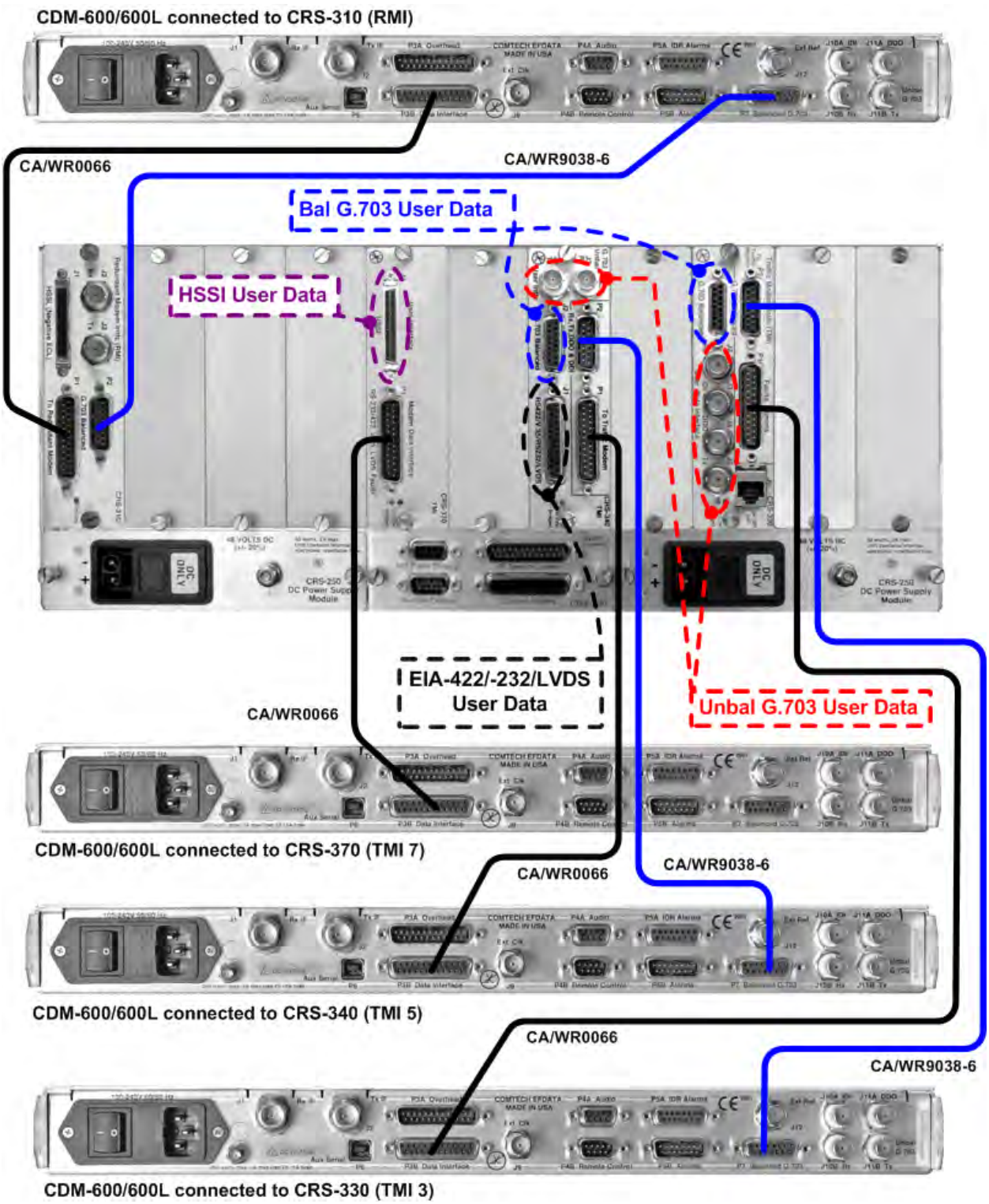


Figure 4-7. Data Cable Connection Example – CRS-300 to CDM-600/600L
(Connections shown for RMI and TMIs 1, 3, 5, and 7 only)

4.4.2 User Data Connections – CRS-300 to User

The User's traffic data from multiplexing equipment or a test data generator should connect to the connectors labeled "User Data Interface" on the TMI(s). This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

IMPORTANT

1. ***Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.***
2. ***Ensure that the correct operation for Balanced or Unbalanced G.703 data is configured on the modem.***

For T1/E1 operation, the optional CN-0000268 T1/E1 Adapter (illustrated in **Figure A-32** in **Appendix A. CABLE DRAWINGS**) may be purchased from Comtech EF Data to adapt the Balanced G.703 DB-15F connector on the User data side of the TMI to a RJ-48 female connection.

4.4.3 ESC Data Connections – CRS-350 to Modems

Refer to **Figure 4-8** to connect and secure the cables between the CRS-350 and each CDM-600/600L modem as follows:

- Connect and secure the CA/WR0066 cable:
  - DB-25F connector on the CRS-350, to
  - DB-25M connectors labeled "P3A Overhead" on the CDM-600/600L.
- Connect and secure the CA/WR9038-6 cable:
  - DB-15M connector on the CRS-350, to
  - DB-15F connectors labeled "P5A IDR Alarms" on the CDM-600/600L.
- Connect and secure the CA/WR9932-1 cable:
  - DB-9M connector on the CRS-350, to
  - DB-9F connectors labeled "P4A Audio" on the CDM-600/600L.

4.4.4 User ESC Data Connections – CRS-350 to User

The User's equipment should be connected to the correct corresponding plug-in card on the front panel of the CRS-350. This replaces the direct connection to the Traffic Modem's "IDR", "Audio" and "Overhead" ports. Refer to **Figure 1-26** in **Chapter 1.5 CRS-350 ESC Switch Description** for detailed information on this interface.

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.

Refer to **Chapter 1.4.3 Modem Interface Cards** for detailed information on the RMI and TMI cards available for use with the CDM-600/600L modems.

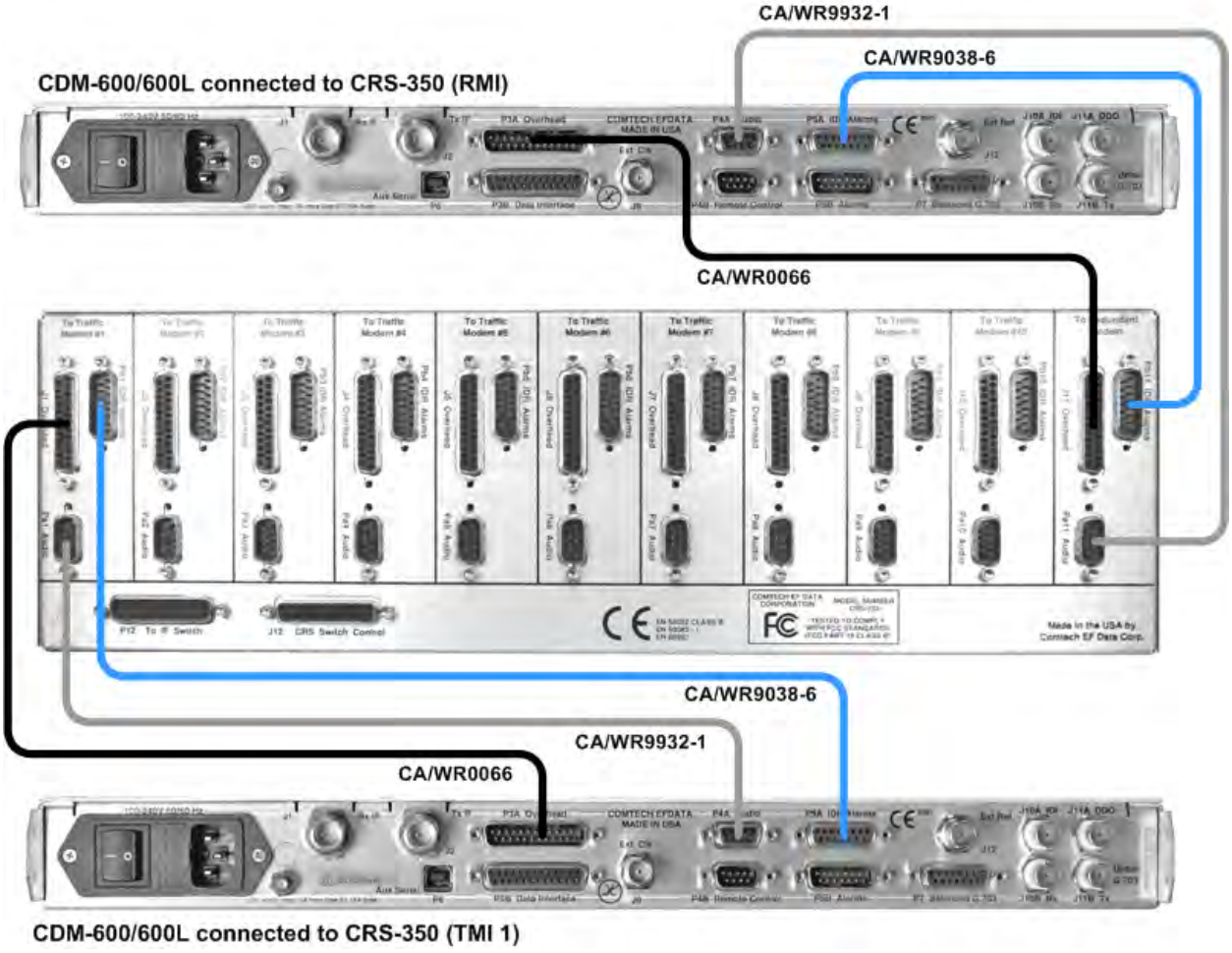


Figure 4-8. Cabling Example for CRS-350 to CDM-600/600L
(Connections shown for RMI and TMI 1 only)

Notes:

4.5 CDM-625 Modem Connections

- **RMI/TMI Limitations and Considerations**
- **Carrier-in-Carrier® (CnC) Data Connections**
- **Control and Data Connections – CRS-300 to Modems**
- **Data Connections – CRS-300 to User**
- **Data Connections – CRS-350 Engineering Service Channel (ESC) Switch**
  - **ESC Data Connections – CRS-350 to Modems**
  - **ESC Data Connections – CRS-350 to User**
- **Using the CDM-625 Modem in CDM-600 Emulator Mode**
  - **Preparing the CDM-625 for Operation in CDM-600/600L Emulation Mode**
  - **Control and Data Connections – CRS-300 to Modems in CDM-600/600L Emulation Mode**

4.5 CDM-625 Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing traffic. The cabling and power-up sequence must be correct to avoid contention in the system from the modem Tx carrier. This sequence is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

4.5.1 RMI/TMI Limitations and Considerations

With some exceptions, Traffic modems with differing data types can all be supported by the Redundant Modem.

Refer to **Table 4-1** for the RMI, TMIs, and cables required to set up a properly configured redundant system. As shown, and regardless of driving traffic data type, the CRS-300 1:10 Redundancy Switch uses the **CRS-310** Redundant Modem Interface (RMI) for all driving traffic configurations.

When using the CDM-625 in a CRS-300 1:10 Redundancy system, TMIs may be mixed within the same CRS-300 with some limitations: while the "P2" (DB-15M) connector on the CRS-310 RMI may be used for Balanced / Unbalanced G.703 *or* Quad E1 traffic, **only one** of these two traffic data types can be used within the TMIs. Accordingly, a CRS-300 that uses any combination of the CRS-325, CRS-330, or CRS-340 TMIs for Balanced / Unbalanced G.703 traffic ***cannot*** have the CRS-365D TMI (for Quad E1 traffic) installed in the same system.

Refer to **Figure 4-10** through **Figure 4-12** for graphic examples of this operational dependency; each figure shows permissible TMI types that can be used for the Traffic Modems.

IMPORTANT

1. ***Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for EIA-422 with RTS/CTS, DTR/DSR signal using the CRS-316, CRS-320 (obsolete), or CRS-340 TMI; or HSSI with CA/TA signals using the CRS-336 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *in this manual for this important configuration information.***
2. ***When using the CDM-625 in Dedicated Management Port mode, all four of the offline modem's Ethernet ports will be disabled unless the user configures one of the four ports as the 'Dedicated Management Port.' For more information, refer to* Sect. 5.4.13.3 CONFIG: IP → Setup *in the CDM-625 Advanced Satellite Modem Installation and Operation Manual.***

4.5.2 Carrier-in-Carrier® (CnC) Data Connections

IMPORTANT

The CA-0000275 cable bypasses the CRS-300 1:10 Redundancy Switch.

If Carrier-in-Carrier® (CnC) is utilized with any Traffic CDM-625, refer to **Figure 4-9** to connect and secure the PMSI Multi-drop CnC Plus Cable CA-0000275 (<11X> DB-9M, 8.25') between the Redundant CDM-625 and any ***CnC-enabled Traffic CDM-625(s)*** as follows:

- DB-9F connector labeled "PMSI" on the Redundant CDM-625, to
- DB-9F connectors labeled "PMSI" on all ***CnC-enabled*** Traffic CDM-625(s).

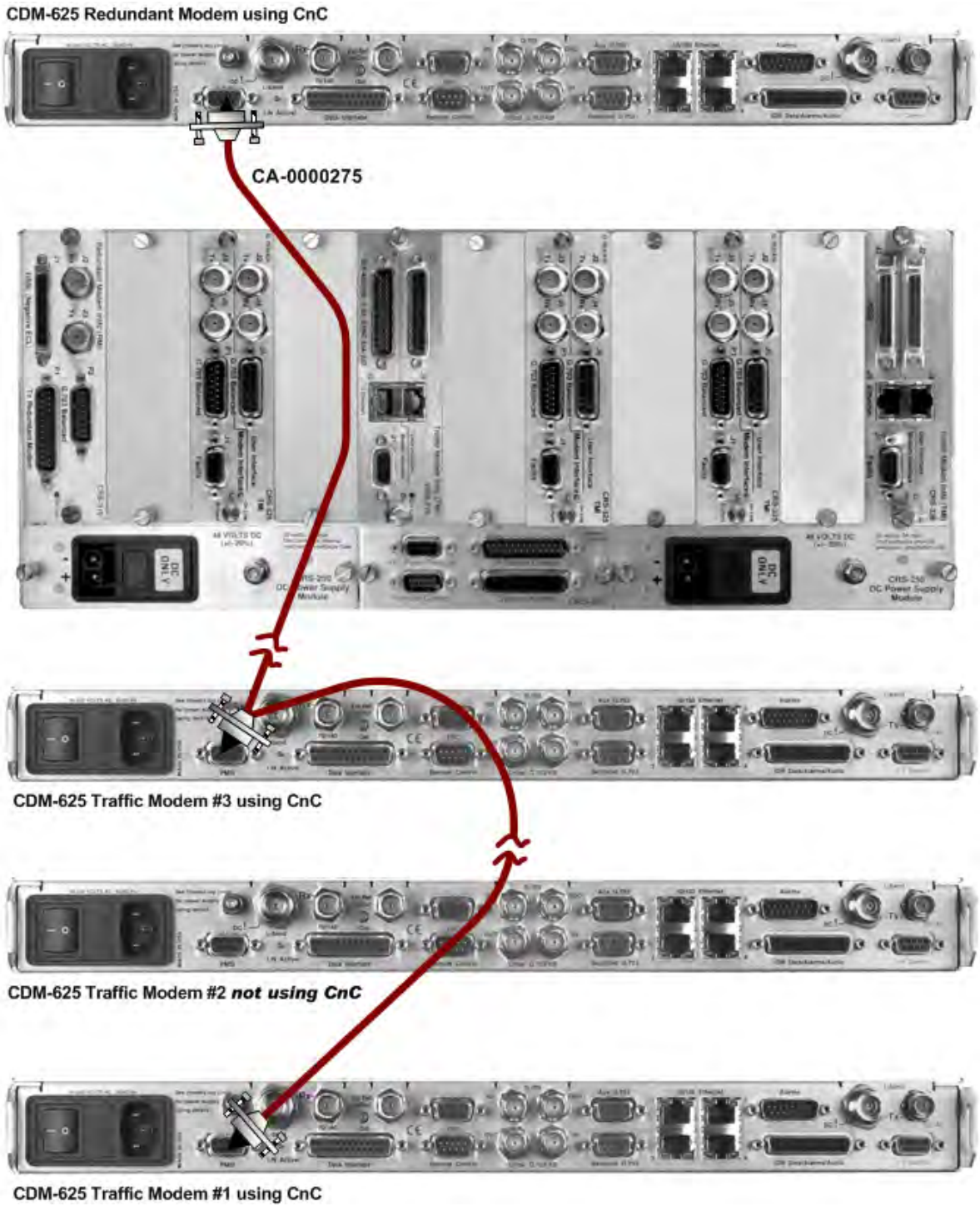

CDM-625 Redundant Modem using CnC
CA-0000275
CDM-625 Traffic Modem #3 using CnC
CDM-625 Traffic Modem #2 not using CnC
CDM-625 Traffic Modem #1 using CnC

Figure 4-9. CDM-625 to CDM-625 CnC® Cable Connection Example
(Connections shown for Redundant Modem and Traffic Modems 1, 2, and 3 only)

4.5.3 Control and Data Connections – CRS-300 to Modem

Table 4-1 shows what TMI and applicable data and control cables are needed for each of the various data types.

Table 4-1. CDM-625 Cable Usage (RMI/TMI)

CDM-625 Cable Usage (See **Appendix A. CABLE DRAWINGS** for cable details)				
Driving Traffic Data Type		**CRS-310 RMI / Cable(s)**	**TMI / Cable(s)**	
G.703 (Sect. 4.5.3.2)	Bal/Unbal	Control: CA/WR0066 Data: CA-0000072	CRS-330/340	Control: CA/WR0066 Data: CA-0000072
	Balanced	Control: CA/WR0066 Data: CA-0000072	CRS-325	Control: CA/WR0066 Data: CA-0000072
	Unbalanced	Control: CA/WR0066 Data: PL/0813-8 (2X)		Control: CA-0000069 Data: PL/0813-8 (2X)
ASI (Sect. 4.5.3.3)		Control: CA/WR0066 Data: PL/0813-8 (2X)	CRS-325	Control: CA-0000069 Data: PL/0813-8 (2X)
EIA-422 (Sect. 4.5.3.4)		Control/Data: CA/WR0066	CRS-316	Control: CA-0000069 Data: CA/WR0066
			CRS-340	Control: CA/WR0066 Data:
HSSI (Sect. 4.5.3.5)		Control/Data: CA/WR0066	CRS-336	Control: CA-0000069 Data: CA/WR9189-6 *with* CIC-60 Adapter Module
LVDS (Sect. 4.5.3.6)		Control/Data: CA/WR0066	CRS-340	Control/Data: CA/WR0066
Ethernet (Sect. 4.5.3.8)	Wired-thru (No Sub-Mux) (Sect. 4.5.3.8.1)	Control: CA/WR0066 Data: CA-0000121	CRS-316 or CRS-336	Control: CA-0000069 Data: PP/CAT5FF7FTGY
	Wired-around (Sub-Mux) (Sect. 4.5.3.8.2)	Control: CA/WR0066 Data (by User): CAT5 to 10/100/1000 Switch	N/A	N/A

4.5.3.1 Required Control Cabling (Regardless of Driving Traffic Data Type)

For RMI connections: The Control/Data Cable CA/WR0066 (DB-25F to DB-25M, 6') provides the serial communication path between the Redundant CDM-625 and the CRS-300 (via the CRS-310 RMI) for all driving traffic data types, and is therefore always required.

For all driving traffic data types, refer to **Figure 4-10** through **Figure 4-12** to connect and secure the CA/WR0066 cable between the Redundant CDM-625 and the CRS-310 RMI on the CRS-300 as follows:

- DB-25F connector labeled "Data Interface" on Redundant CDM-625, to
- DB-25M connector labeled "P1" on the CRS-310 RMI.

For TMI connections: Depending on the driving data traffic type, in addition to its use as a control cable between the Redundant CDM-625 and the CRS-310 RMI, the CA/WR0066 cable is used as a control cable between the Traffic CDM-625(s) and the CRS-330 or CRS-340 TMI; as a data cable with the CRS-316 TMI; and as a combination control/data cable when used with the CRS-340 TMI.

For specific details regarding the CA/WR0066 cable's use as a TMI control and/or data cable, refer to the data connection cabling instructions that follow for each driving traffic data type.

Additionally, when either the CRS-316, CRS-325, or CRS-336 TMI is used, the CA-0000069 (HD-15M to DB-9M, 6') Control Cable is required between the installed TMI(s) and Traffic CDM-625(s).

Refer to **Table 4-1** in **Sect. 4.5.3** and to the data connection cabling instructions that follow for this cable's required use with the pertinent driving traffic data type.

4.5.3.2 G.703 Balanced / Unbalanced Data Connections

If G.703 (Balanced/Unbalanced) is the driving traffic data type, the means of interconnection are dependant on the TMI used. **Figure 4-10** illustrates use of the **CRS-330** and **CRS-340** TMIs with G.703, while **Figure 4-11** illustrates use of the **CRS-325** TMI with G.703.

TMIs used for G.703 traffic are not compatible with the CRS-365D TMI used for Quad E1 traffic when used within the same CRS-300.

Make all connections according to the information that follows:

► **When using the CRS-330 or CRS-340 TMIs (as shown in Figure 4-10):**

First, connect the Control/Data Cable CA/WR0066 (for control purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Next, connect and secure the Control/Data Cable CA/WR0066 (for control purposes) between the TMI(s) and Traffic CDM-625(s) as follows:

- DB-25M connector labeled "P1" on the TMI(s), to
- DB-25F connector labeled "Data Interface" on the Traffic CDM-625(s).

Finally, connect and secure the Data Cable CA-0000072 (DB-15F to DB-9M, 6'), used for either Balanced or Unbalanced G.703 data, between the RMI or TMI(s) and the Redundant and Traffic CDM-625(s) as follows:

- DB-15M connector labeled "P2" on the RMI or TMI(s), to
- DB-9F connector labeled "Balanced G.703" on the Redundant and Traffic CDM-625(s).

► **When using a CRS-325 TMI (as shown in Figure 4-11):** Specific cabling requirements apply for operation with the CDM-625.

First, connect the Control/Data Cable CA/WR0066 (for control purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Next, connect and secure the Data Cable CA-0000072 (DB-15F to DB-9M, 6'), between the Redundant CDM-625 and RMI as follows:

- DB-9F connector labeled "Balanced G.703" on the Redundant CDM-625, to
- DB-15M connector labeled "P2" on the RMI.

Then, connect and secure the Control Cable CA-0000069 (HD-15M to DB-9M, 6') between the TMI(s) and Traffic CDM-625(s) as follows:

- HD-15F connector labeled "J1" on the TMI(s), to

- DB-9F connector labeled "1:1 Control" on the Traffic CDM-625(s).

Finally, for **Balanced G.703 data *only*,** connect and secure the Data Cable CA-0000072 (DB-15F to DB-9M, 6') between the TMI(s) and Traffic CDM-625(s) as follows:

- DB-15M connector labeled "P2" on the TMI(s), to
- DB-9F connector labeled "Balanced G.703" on the Traffic CDM-625(s).

–or–

For **Unbalanced G.703 data *only***, connect and secure the pair of PL/0813-8 cables (75Ω BNC to BNC, 8') as follows:

- BNC connector labeled "J3 Tx"on the TMI(s) to BNC connector labeled "Unbal G.703/ASI – IN" on the Traffic CDM-625s, and
- BNC connector labeled "J5 Rx"on the TMI(s) to BNC connector labeled "Unbal G.703/ASI – OUT" on the Traffic CDM-625(s).

4.5.3.3 ASI Data Connections

If ASI is the driving traffic data type (refer to Figure 4-10 through Figure 4-12):

First, connect the Control/Data Cable CA/WR0066 (for control purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Next, connect and secure a pair of PL/0813-8 cables (75Ω BNC to BNC, 8'), for data purposes, between the Redundant CRS-625 and the RMI as follows:

- BNC connector labeled "J3 Tx" on the RMI to BNC connector labeled "Unbal G.703/ASI – IN" on the Redundant CDM-625, and
- BNC connector labeled "J2 Rx" on the RMI to BNC connector labeled "Unbal G.703/ASI – OUT" on the Redundant CDM-625.

Then, connect and secure a pair of PL/0813-8 cables (75Ω BNC to BNC, 8') between the CRS-325 TMI(s) and the Traffic CDM-625(s) as follows:

- BNC connector labeled "J3 Tx" on the TMI(s), to BNC connector labeled "Unbal G.703/ASI – IN" on the Traffic CDM-625(s), and
- BNC connector labeled "J5 Rx"on the TMI(s) to BNC connector labeled "Unbal G.703/ASI – OUT" on the Traffic CDM-625(s).

Finally, connect and secure the Control Cable CA-0000069 (HD-15M to DB-9M, 6') between the CRS-325 TMI(s) and Traffic CDM-625(s) as follows:

- HD-15F connector labeled "J1" on the TMI(s), to
- DB-9F connector labeled "1:1 Control" on the Traffic CDM-625(s).

4.5.3.4 EIA-422 Data Connections

If EIA-422 is the driving traffic data type (refer to Figure 4-10 through Figure 4-12):

First, connect the Control/Data Cable CA/WR0066 (for control/data purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Next, make all connections according to the information that follows:

► **When using the CRS-316 TMI:** Connect and secure the Control/Data Cable CA/WR0066 (for data purposes) between the TMI(s) and Traffic CDM-625(s) as follows:

- DB-25M connector labeled "P1" on the TMI(s), to
- DB-25F connector labeled "Data Interface" on the Traffic CDM-625(s).

Then, connect and secure the Control Cable CA-0000069 (HD-15M to DB-9M, 6') between the TMI(s) and the Traffic CDM-625(s) as follows:

- HD-15F connector labeled "J1" on the TMI(s), to
- DB-9F connector labeled "1:1 Control" on the Traffic CDM-625(s).

► **When using the CRS-340 TMI:** Connect and secure the Control/Data Cable CA/WR0066 (for control/data purposes) between the TMI(s) and the Traffic CDM-625(s) as follows:

- DB-25M connector labeled "P1" on the TMI(s), to
- DB-25F connectors labeled "Data Interface" on the Traffic CDM-625s.

4.5.3.5 HSSI Data Connections

If HSSI is the driving traffic data type (refer to Figure 4-10 and Figure 4-11):

First, connect the Control/Data Cable CA/WR0066 (for control/data purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Next, connect and secure the Control Cable CA-0000069 (HD-15M to DB-9M, 6') between the TMI(s) and the Traffic CDM-625(s) as follows:

- HD-15F connector labeled "J1" on the TMI(s), to
- DB-9F connector labeled "1:1 Control" on the Traffic CDM-625(s).

Then, connect and secure the Control Cable CA/WR9189-6 (HD-50M → HD-50M, 6') – used for data purposes – between the TMI(s) and Traffic CDM-625(s) as follows:

- 50-pin Type 'HD' HSSI (SCSI-II) female connector labeled "HSSI" on the TMI(s), to
- 50-pin Type 'HD' HSSI (SCSI-II) female connector on the CIC-60 Adapter Module, to
- DB-25F connector labeled "Data Interface" on the Traffic CDM-625(s).

4.5.3.6 LVDS Data Connections

If LVDS is the driving traffic data type (refer to Figure 4-10, Figure 4-12, and Figure 4-13):

First, connect the Control/Data Cable CA/WR0066 (for control/data purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Then, connect and secure the Control/Data Cable CA/WR0066 (for data purposes) between the TMI(s) and Traffic CDM-625(s) as follows make all connections as follows:

- DB-25M connector labeled "P1" on the TMI(s), to
- DB-25F connector labeled "Data Interface" on the Traffic CDM-625(s).

4.5.3.7 Quad E1 Data Connections

If Quad E1 is the driving traffic data type (refer to Figure 4-12 and **Figure 4-13):**

First, connect the Control/Data Cable CA/WR0066 (for control purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).

Next, connect and secure the Data 'Y' Cable CA-0000073 (DB-15F to <2X> DB-9M, 6') between the Redundant CDM-625 and the CRS-300 as follows:

- DB-15M connector labeled "P2" on the RMI, to
- DB-9F connector labeled "Balanced G.703" on the Redundant CDM-625 (using "P3" connector on cable),

–and–

- DB-9F connector labeled "Aux G.703" on the Redundant CDM-625 (using "P2" connector on cable).

Then, connect and secure the Control Cable CA-0000069 (HD-15M to DB-9M, 6') between the **CRS-365D** TMI(s) and Traffic CDM-625(s) as follows:

- HD-15F connector labeled "J1" on the TMI(s), to
- DB-9F connector labeled "1:1 Control" on the Traffic CDM-625(s).

Finally, connect and secure a pair of Data Cables CA-0000136 (DB-9F to DB-9M, 6') as follows:

- DB-9M connector labeled "P1" on the TMI(s), to
- DB-9F connector labeled "Aux G.703" on the Traffic CDM-625(s),

–and–

- DB-9M connector labeled "P2" on the TMI(s), to
- DB-9F connector labeled "Balanced G.703" on the Traffic CDM-625(s).

4.5.3.8 Ethernet Data Connections

IMPORTANT

1. ***When using the CDM-625 in Dedicated Management Ethernet Port mode, all four of the offline modem's Ethernet ports will be disabled unless the user configures one of the four ports as the 'Dedicated Management Port.' For more information, refer to* Sect. 5.4.13.3 CONFIG: IP → Setup *in the CDM-625 Advanced Satellite Modem Installation and Operation Manual.***
2. ***When Ethernet (with no Sub-Mux) is the dedicated data interface employed in the redundancy system, the user should make all cabling connections using the wired-thru connection method explained in Sect. 4.5.3.8.1.***
3. ***When Ethernet is utilized in combination with other data interfaces in the redundancy system – i.e., an IP Sub-Mux configuration – the user should make all cabling connections using the wired-around connection method explained in Sect 4.5.3.8.2.***

4.5.3.8.1 Ethernet Data Connection – Wired-thru Method (No Sub-Mux)

IMPORTANT

This redundancy approach is the* recommended *and* preferred *connection method.

The **wired-thru** Ethernet connection on the CRS-300 is the easiest and simplest choice for Ethernet redundancy. This connection method – the same as used on the standard serial data interface – provides a single connection (i.e., using one of four available RJ-45 ports) for the User Data Interface and provides simple Form-C relays that route the Ethernet connection from the User connection to either the Traffic or Redundant Modem.

If the Wired-thru method of Ethernet is the driving traffic data type [Note 1] (refer to Figure 4-10 through Figure 4-12):

- **First,** connect the Control/Data Cable CA/WR0066 (for control/data purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).
- **Next,** connect and secure the Ethernet Data Cable CA-0000121 (HD-50M to RJ-45M, 6') between the Redundant CDM-625 and the RMI:
  - RJ-45F "10/100 Ethernet" connector labeled "1" (Port1) on the Redundant CDM-625, to
  - HD-50M connector labeled "J1" on the RMI.
- **Then**, connect and secure the Control Cable CA-0000069 (HD-15M to DB-9M, 6') between the CRS-316 or CRS-336 TMI(s) and the Traffic CDM-625(s).
- **Finally,** connect and secure the Cat5 Data Cable PP/CAT5FF7FTGY (RJ-45M to RJ-45M, 7') between the TMI(s) and Traffic CDM-625(s):
  - RJ-45F connector labeled "J5" on the TMI(s)[Notes 2,3], to
  - RJ-45F "10/100 Ethernet" connector labeled "1" (Port 1) on the Traffic CDM-625(s).

NOTE

1. ***Where the traffic data type is Ethernet, the User can only use one of four Ethernet ports, in Ethernet Bridge Mode, on the CDM-625 rear panel.***
2. ***The CRS-316 can be used for single-port Ethernet Bridge Mode or EIA-530, but not both at the same time. The CRS-316 does not handle Sub-Mux operation (where the CDM-625 may use both Ethernet Bridge Mode and EIA-530 simultaneously). Sub-Mux operation is explained in the next section,* Sect. 4.5.3.8.2 Ethernet Data Connection – Wired-around Method (Sub-Mux)*.***
3. ***The CRS-336 can be used for single-port Ethernet Bridge Mode or HSSI, but not both at the same time. The CRS-336 does not handle Sub-Mux operation (where the CDM-625 may use both Ethernet Bridge Mode and EIA-530 simultaneously). Sub-Mux operation is explained in the next section,* Sect. 4.5.3.8.2 Ethernet Data Connection – Wired-around Method (Sub-Mux)*.***

4.5.3.8.2 Ethernet Data Connection – Wired-around Method (Sub-Mux)

IMPORTANT

While this redundancy approach is not recommended, it can be used after study of the LAN and WAN sides of the IP networks.

Sub-Mux is a secondary framing structure which combines one to four ports of 10/100 Ethernet (IP) traffic with any currently available combination of framing and interface type (i.e. HSSI, EIA-422, ASI or G.703, but excluding IP itself). The composite data rate to the modulator and from the demodulator is referenced to the primary, non-IP data interface rate by a specific ratio selected by the user.

For more information about Sub-Mux, refer to **Chapter 15. IP SUB-MUX** in the **CDM-625 Advanced Satellite Modem Installation and Operation manual**.

Where the CDM-625 Sub-Mux mode will be used, the **wired-around** Ethernet connection is used with the CDM-625 modem and CRS-300. With Ethernet Bridge Mode configured for the wired-around method, this gives full redundancy capability to both selected data types in Sub-Mux mode. However, care must be taken to ensure there are no Ethernet network loops or connection problems – *this method should* **only** *be used if the CDM-625 will be using the Sub-Mux.* In general, the wired-around approach can be used in a hub-to-remotes configuration.

Figure 4-13 depicts the cabling example for a 1:N Redundant system with Traffic modems 3 and 9 configured for IP Sub-Mux. When IP Sub-Mux is utilized with any other traffic data type, observe the following:

- **First,** connect and secure the Control/Data Cable CA/WR0066 (for control/data purposes) between the Redundant CDM-625 and the RMI (see **Sect. 4.5.3.1**).
- **Next,** connect and secure the desired serial traffic data cables as described in **Sects. 4.4.3.2** through **4.5.3.5**.
- **Then,** *for each CDM-625 using Sub-Mux,* connect a user-provided Cat5 Ethernet data cable from any **one** of the four 10/100 Ethernet Bridge Mode ports on the CDM-625 to one port of a user-provided 10/100/1000 Layer 2 Ethernet Switch.

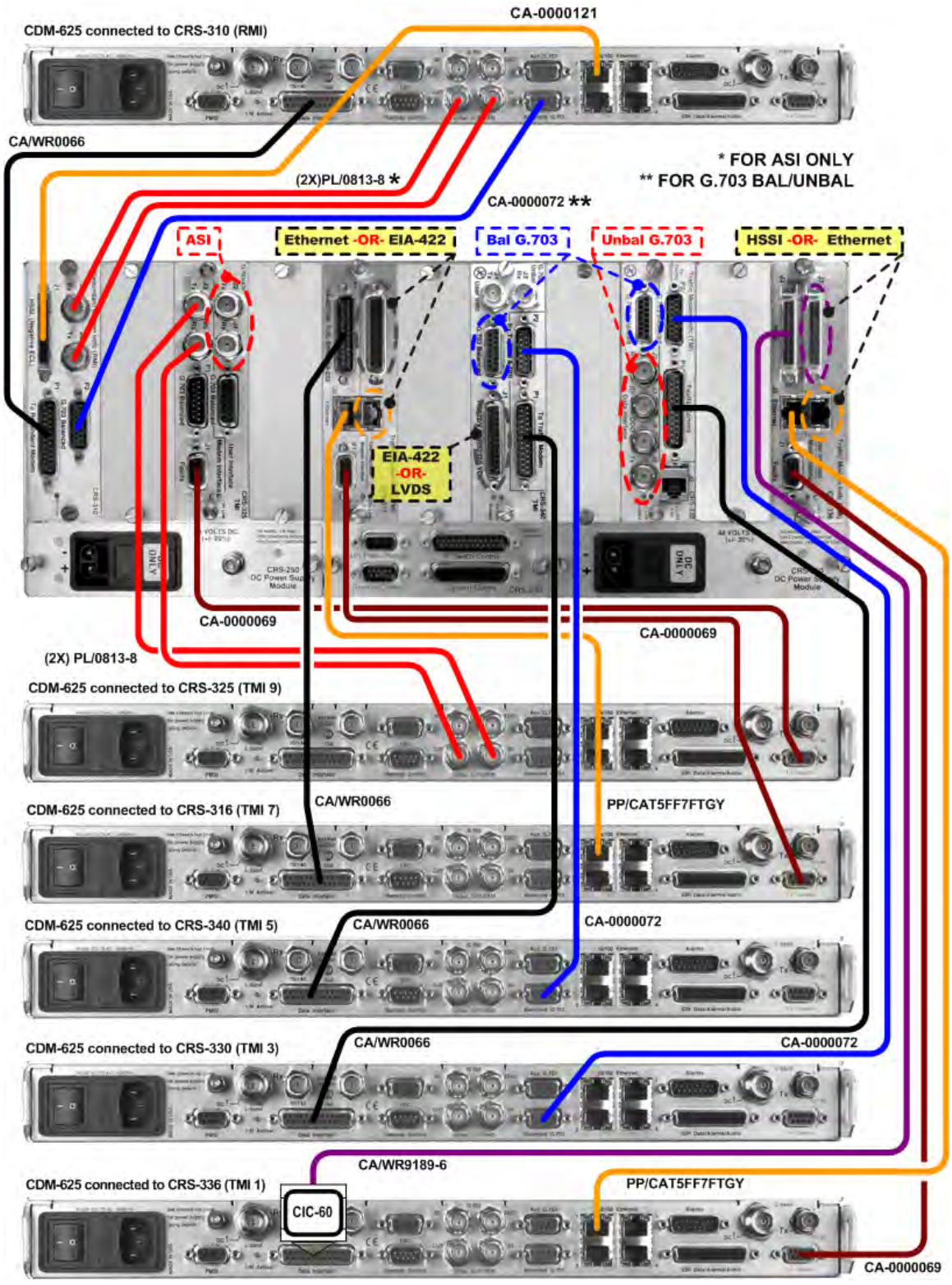


Figure 4-10. CRS-300 to CDM-625 Cable Connection Example – G.703-driven Configuration
(Connections shown for RMI and TMIs 1, 3, 5, 7, and 9 only)

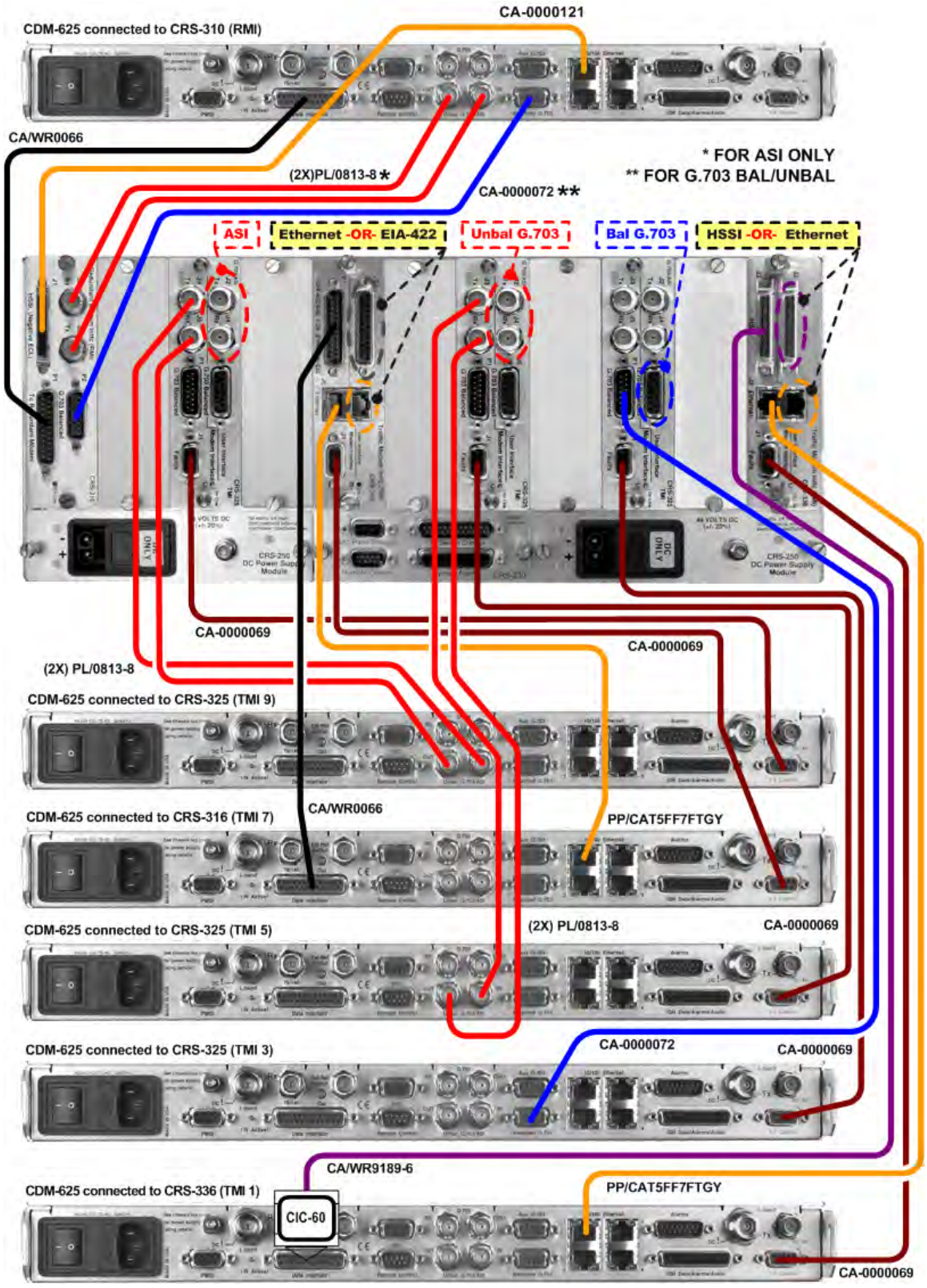


Figure 4-11. CRS-300 to CDM-625 Cable Connection Example – G.703-driven Configuration
(Connections shown for RMI and TMIs 1, 3, 5, 7, and 9 only)

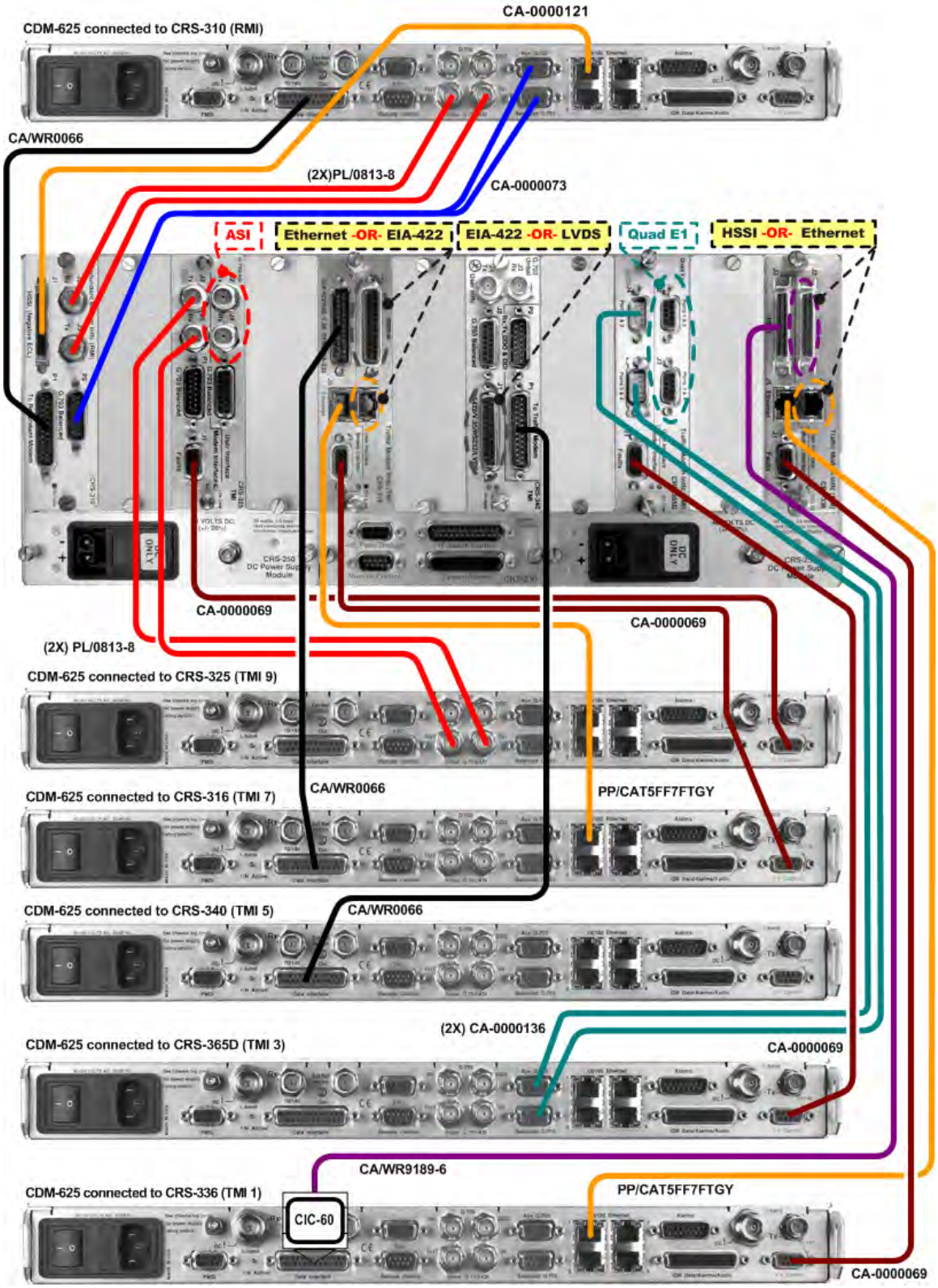


Figure 4-12. CRS-300 to CDM-625 Cable Connection Example – Quad E1-driven Configuration
(Connections shown for RMI and TMIs 1, 3, 5, 7, and 9 only)

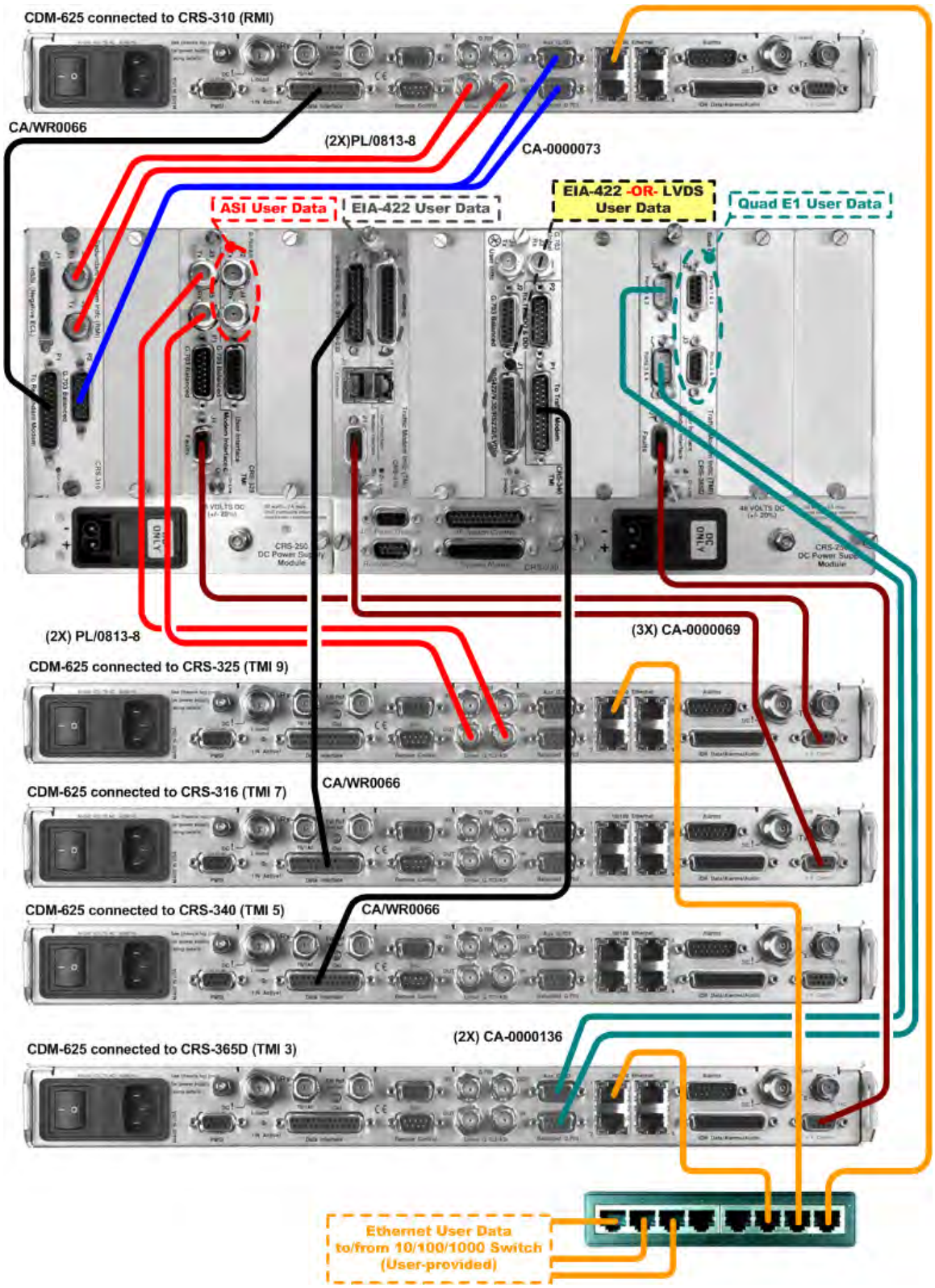


Figure 4-13. CRS-300 to CDM-625 Cable Connection Example – Sub-Mux TMIs 3 & 9
(Connections shown for RMI and TMIs 1, 3, 5, 7, and 9 only)

4.5.4 Data Connections – CRS-300 to User

The User's traffic data from an external router, multiplexing equipment or test data generator should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic CDM-625's "Data Interface" connectors.

For Quad E1 operation, the optional CA-0000163 and CA-0000164 Adapter Cables, illustrated in **Figure A-30** and **Figure A-31**, respectively, in **Appendix A. CABLE DRAWINGS**, may be purchased from Comtech EF Data to adapt the Balanced G.703 or Auxiliary G.703 9-pin Type 'D' female connectors to either a standard 15-pin Type 'D' or a RJ-48 female connection pair.

IMPORTANT

4. ***Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.***
5. ***Ensure that the correct operation for Balanced or Unbalanced G.703 data is configured on the modem.***

4.5.5 Data Connections – CRS-350 Engineering Service Channel (ESC) Switch

4.5.5.1 ESC Data Connections – CRS-350 to Modems

Refer to **Figure 4-14** to connect and secure the Multi-purpose Cable CA-0000074 (2 places) between the rear panels of the CRS-350 and the CDM-625s as follows:

- DB-25F Jxx "Overhead," D-9M Paxx "Audio," and DB-15M Pbxx "IDR Alarms" connectors on the CRS-350 rear panel (where xx specifies the number 1 through 10 Traffic Modem, and 11 is reserved for the Redundant Modem), to
- HD-44F "IDR Data/Alarms/Audio" and DB-9M "ESC" connectors on the Redundant and Traffic CDM-625s.

4.5.5.2 ESC Data Connections – CRS-350 to User

The User's equipment should be connected to the correct corresponding plug-in UDI (User Data Interface) card on the front panel of the CRS-350. This replaces the direct connection to the Traffic CDM-625's "IDR", "Audio" and "Overhead" ports.

4.5.6 Operation of the CDM-625 in CDM-600/600L Emulation Mode

With the exception of EIA-232 type traffic data handling, the CDM-600 Emulation Mode enables the CDM-625 to serve as an operationally transparent replacement unit for the CDM-600/600L Open Network Satellite Modems.

4.5.6.1 Preparing the CDM-625 for Operation in CDM-600/600L Emulation Mode

The CDM-625 may be set for operation in CDM-600/600L Emulation mode by selecting this mode of operation from the CDM-625 front panel. From the top display menu:

SELECT: UTILITY → Em → Emulation Mode

Use the ▼▲ buttons on the keypad to select the appropriate emulation mode.

The choices from this display are:

- **Normal: CDM-625**
- **Emulate: CDM-600**, and
- **Emulate: CDM-600L**.

Once the desired emulation mode is selected, press the ENT button to save the configuration.

4.5.6.2 Control and Data Connections – CRS-300 to Modems in CDM-600/600L Emulation Mode

For each CDM-625 that replaces a CDM-600/600L modem: Refer to **Figure 4-15** to connect and secure the CA/WR Control/Data Cable cables between each CDM-625 and the CRS-300 as follows:

- DB-25M connector labeled "P1" on the RMI or TMI(s), to
- DB-25F connector labeled "Data Interface" on the CDM-625.

For all system configurations and cable interconnection of the various traffic data types available for the CDM-625 in this operational mode, refer to **Chapter 4.5.1 Control and Data Connections – CRS-300 to Modems** for specific details.

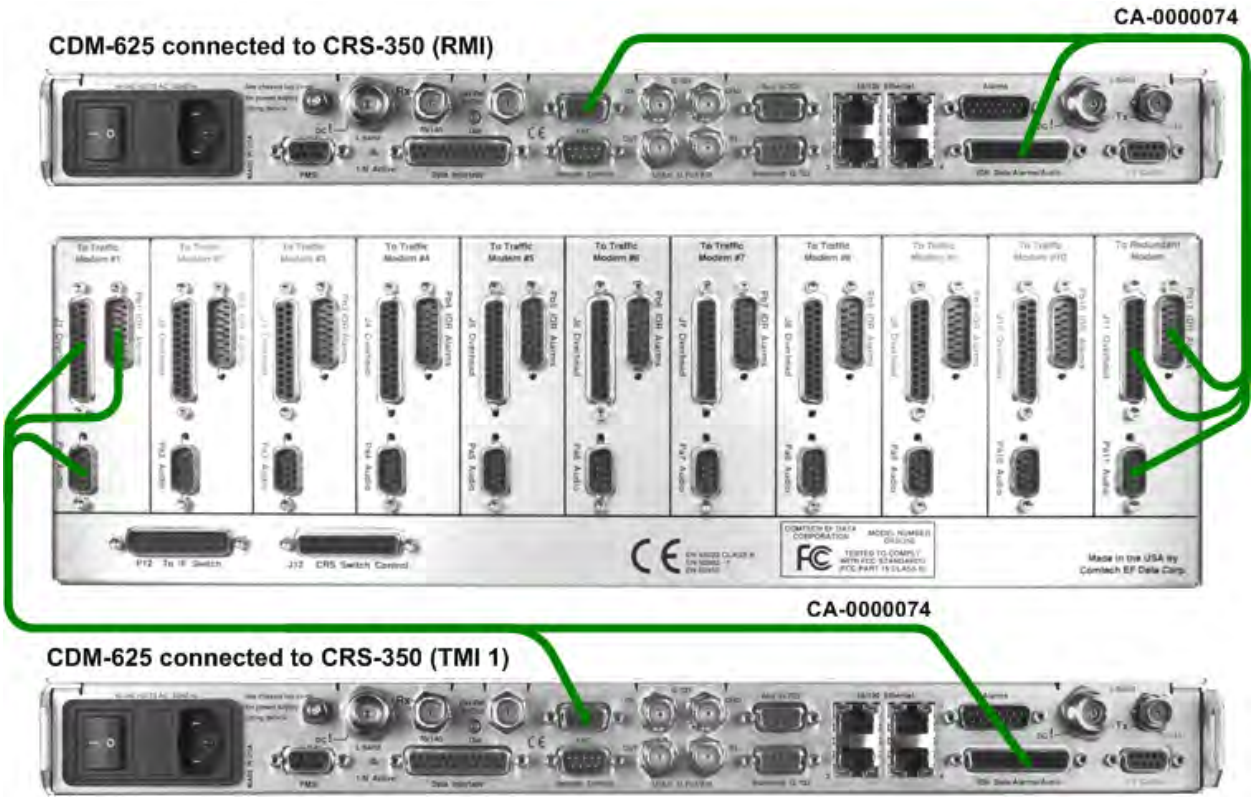


Figure 4-14. Cabling Example for CRS-350 to CDM-625
(Connections shown for RMI and TMI 1 only)

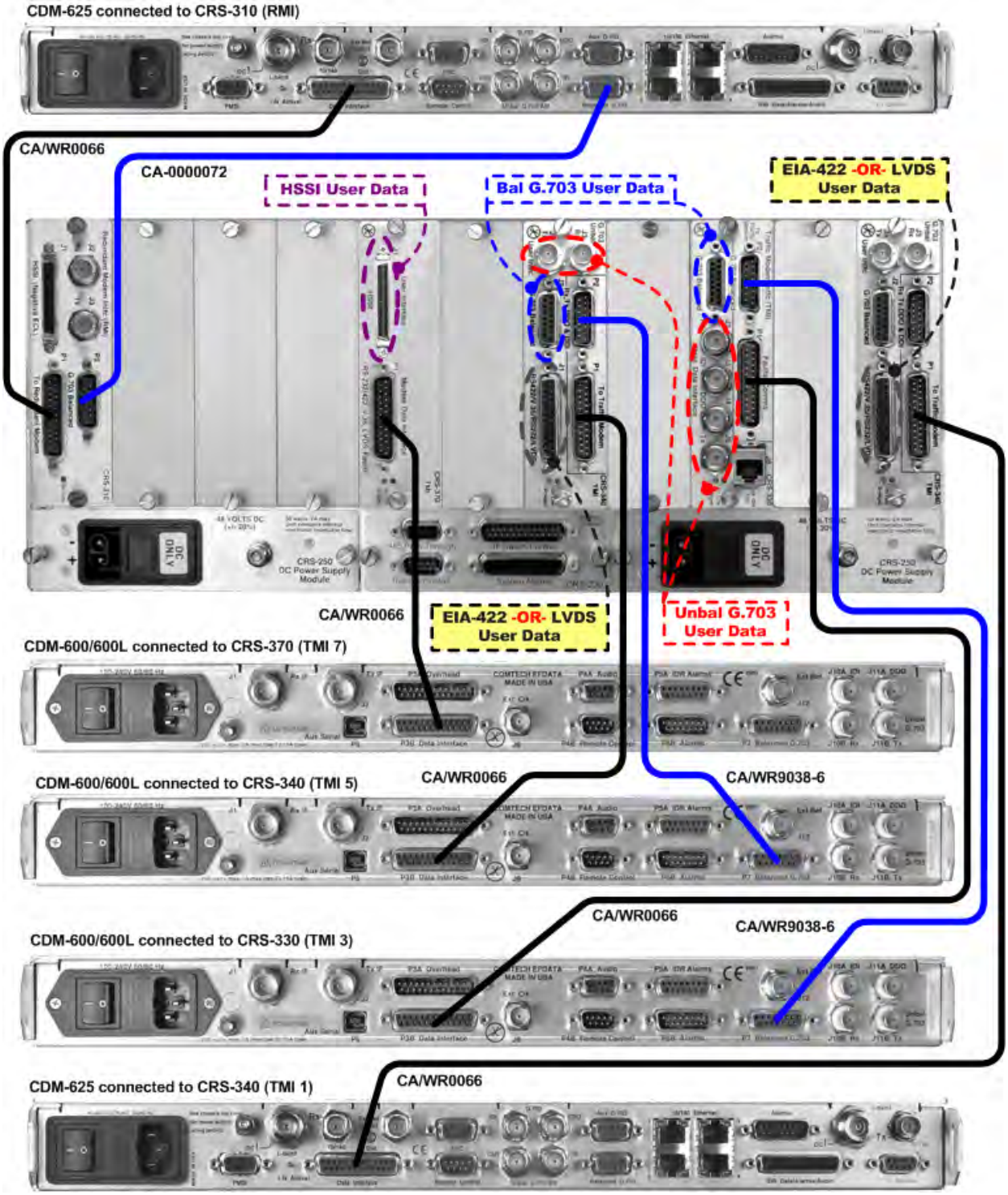


Figure 4-15. Data Cables - CRS-300 to CDM-625 (CDM-600/600L Emulation Mode)
(Connections shown for RMI and TMIs 1, 3, 5, and 7 only)

Notes:

4.6 CDM-Qx/QxL Modem Connections

- **RMI/TMI Limitations and Considerations**
- **EIA-485 Connections – CRS-300 to Modems**
- **Control Y-Cable Connections – CRS-300 to Modems**
- **Traffic Data Connections – CRS-300 to Modems**
- **User Data Connections – CRS-300 to User**

4.6 CDM-Qx/QxL Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing *traffic*. The cabling, power-up sequence and COMs connections must be correct to avoid contention in the system from the modem Tx carrier. This information is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

As shown in **Figure 4-18** through **Figure 4-21**, the CA/WR12069-1 Control Y-Cable provides fault information from the modem and IF-Mute to the modem, and is therefore always required.

4.6.1 RMI/TMI Limitations and Considerations

Because the CDM-Qx/QxL redundant modem can only support one type of data interface, the TMIs cannot be mixed within the same CRS-300 Redundancy Switch.

IMPORTANT

Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for EIA-422 with RTS/CTS, DTR/DSR signal using the CRS-316 TMI, or for HSSI with CA/TA signals using the CRS-336 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information.

4.6.2 EIA-485 Connections – CRS-300 to Modems

An EIA-485 Multi-drop cable provides the communication path between the Switch and the modems. There are two types of EIA-485 Multi-drop cable available: a standard CA/WR11417-1 shielded cable to guard against EMC (Electromagnetic Compatibility) concerns, and an optional CA/RB11423-1 ribbon cable. Both are available from Comtech EF Data.

Refer to **Figure 4-16** to connect the EIA-485 multi-drop cable between the Switch and the modems as follows:

- Connect and secure (1) CA/WR11418-1 EIA-485 terminator on each far-end DB-9F connector of the appropriate EIA-485 multi-drop cable (the standard CA/WR11417-1 shielded cable or the optional CA/RB11423-1 ribbon cable).
- Connect and secure one end of the Null Modem Cable CA/WR11419-1 to the DB-9F connector labeled “485 Pass-Through” on the CRS-300’s CRS-230 System Controller.
- Connect and secure the EIA-485 multi-drop cable to all CDM-Qx/QxL modems and to the DB-9M connector on the Null Modem Cable.

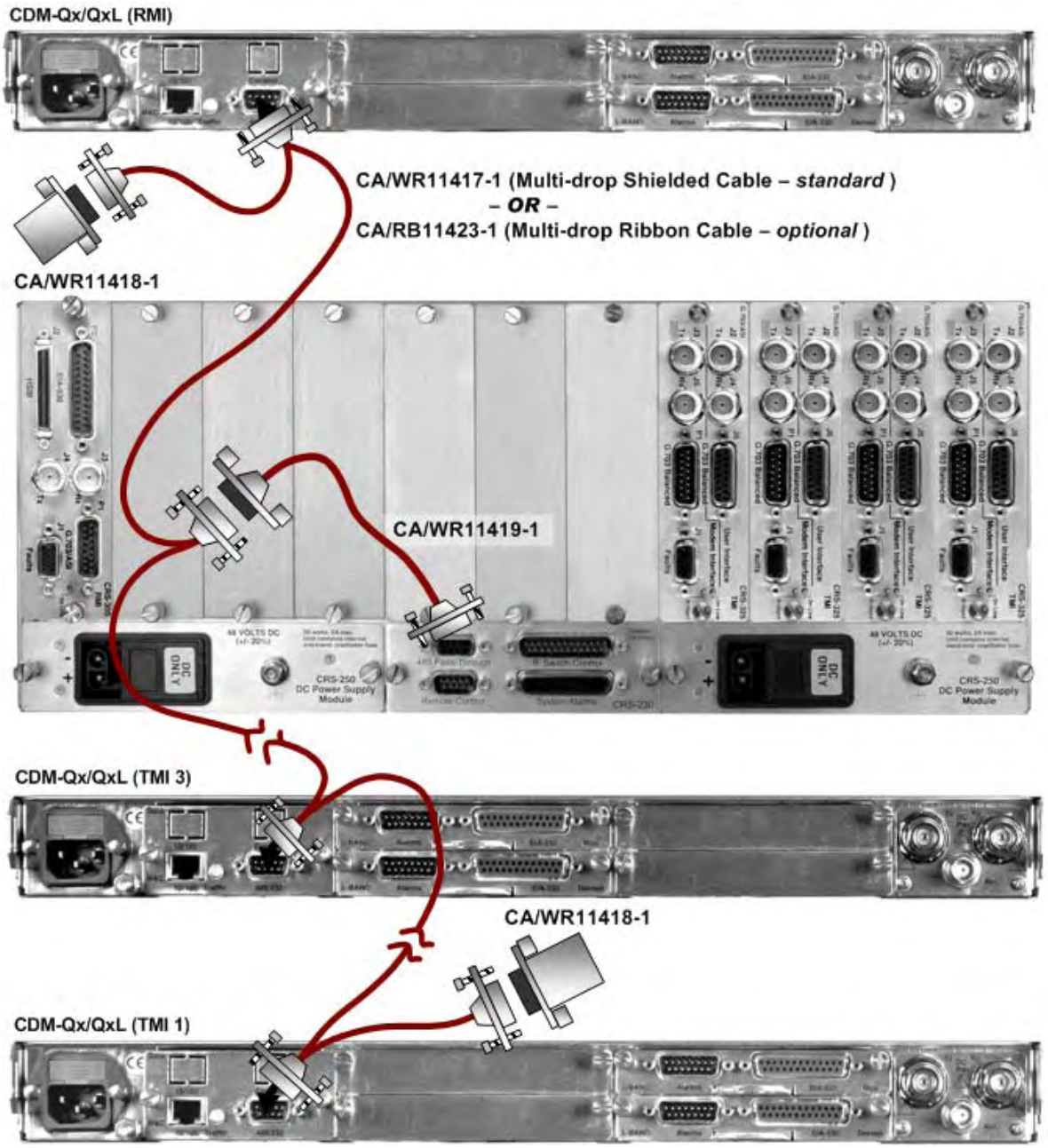


Figure 4-16. EIA-485 Multi-drop Cabling Example – CRS-300 to CDM-Qx/QxL
(Connections shown for RMI and TMIs 1 and 3 only)

4.6.3 Control Y-Cable Connections – CRS-300 to Modems

All traffic data configurations require the Control Y-Cable CA/WR12069-1, connected between the CRS-300 RMI/TMI(s) and each CDM-Qx/QxL as follows:

- HD-15F connector labeled "J1" on the RMI or TMI(s), to
- DB-15M connectors labeled "Alarms" on each CDM-Qx/QxL modulator and demodulator:
    - J1 of the Control Y-Cable goes to the modulator Alarm connector.
    - J2 of the Control Y-Cable goes to the demodulator Alarm connector.

4.6.4 Traffic Data Connections – CRS-300 to Modems

Connect and secure the cables between each CDM-Qx/QxL and the CRS-300 as follows:

If EIA-530 V.35/EIA-232 is the traffic data type, refer to **Figure 4-17** to connect and secure the Control/Data Cable CA/WR0066 as follows:

- DB-25M connector labeled "P2" on the RMI or "P1" on the TMI(s), to
- DB-25F connector labeled "EIA-530" on the CDM-Qx/QxL demodulator.

If Balanced G.703 is the traffic data type, refer to **Figure 4-18** to connect and secure the Data Cable CA/WR9038-6 as follows:

- DB-15M connector labeled "P1" on the RMI or TMI(s), to
- DB-15F connector labeled "G.703" on the CDM-Qx/QxL demodulator.

If Unbalanced G.703 is the traffic data type, refer to **Figure 4-19** to first connect and secure the 75Ω BNC Tx Cable CA/WR0813-8 as follows:

- BNC connector labeled "J4" on the RMI or "J3" on the TMI(s), to
- BNC connector labeled "Tx" on the demodulator.

Next, connect and secure the BNC Rx Cable CA/WR0813-8 as follows:

- BNC connector labeled "J3" on the RMI or "J5" on the TMI(s), to
- BNC connector labeled "Rx" on the demodulator.

If HSSI is the traffic data type, refer to **Figure 4-20** to connect and secure the HSSI Data Cable CA/WR9189-6 as follows:

- HSSI connector labeled "J2" on the RMI or "J3" on the TMI(s), to
- HSSI connector labeled "HSSI" on the demodulator.

If Quad E1 is the traffic data type, refer to **Figure 4-21** to first connect and secure the Quad E1 RMI Data Cable CA/WR13018 as follows:

- DB-15M connector labeled "P1" on the RMI, to
- (4X) RJ-48 connectors labeled "Port 1" through "Port 4" on the Redundant CDM-Qx/QxL.

Next, connect and secure the (4X) Quad E1 TMI Data Cables (CEFD P/N PP/CAT5FF7FTGY) as follows:

- RJ-48 connectors labeled "Port 1" through "4" on the TMI(s), to
- RJ-48 connectors labeled "Port 1" through "Port 4" on the Traffic CDM-Qx/QxL.

4.6.5 User Data Connections – CRS-300 to User

The User's traffic data from multiplexing equipment or a test data generator should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

Because the Redundant Modem's function is to replace a faulted traffic modem, the RMI does not have a User Data Interface.

Refer to **Chapter 1.4.4 Modem Interface Cards** for detailed information on the RMI and TMI cards available for use with the CDM-Qx/QxL modems.

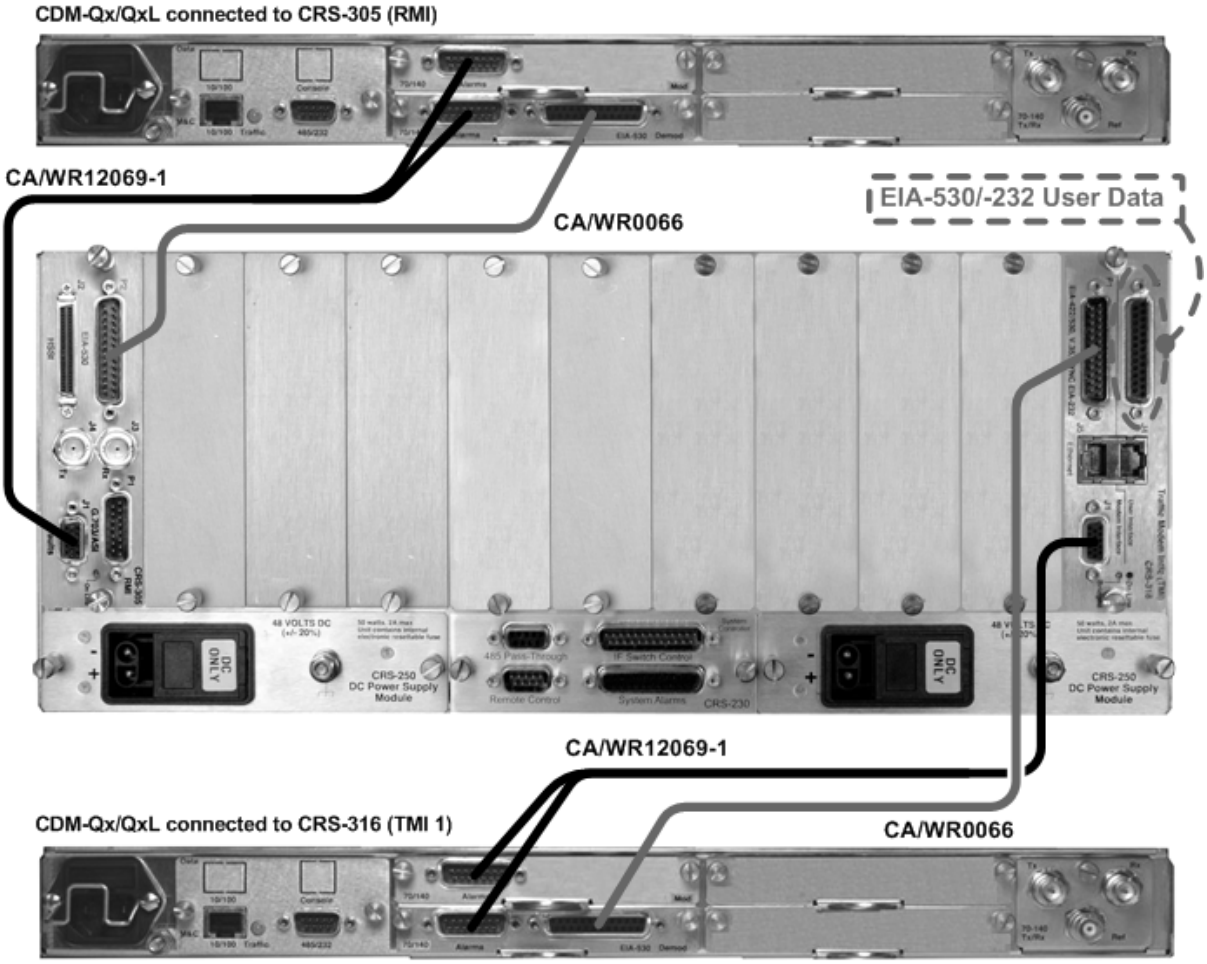


Figure 4-17. Control Y-Cables and EIA-530/-232 Data Cables – CRS-300 to CDM-Qx/QxL
(Connections shown for RMI and TMI 1 only)

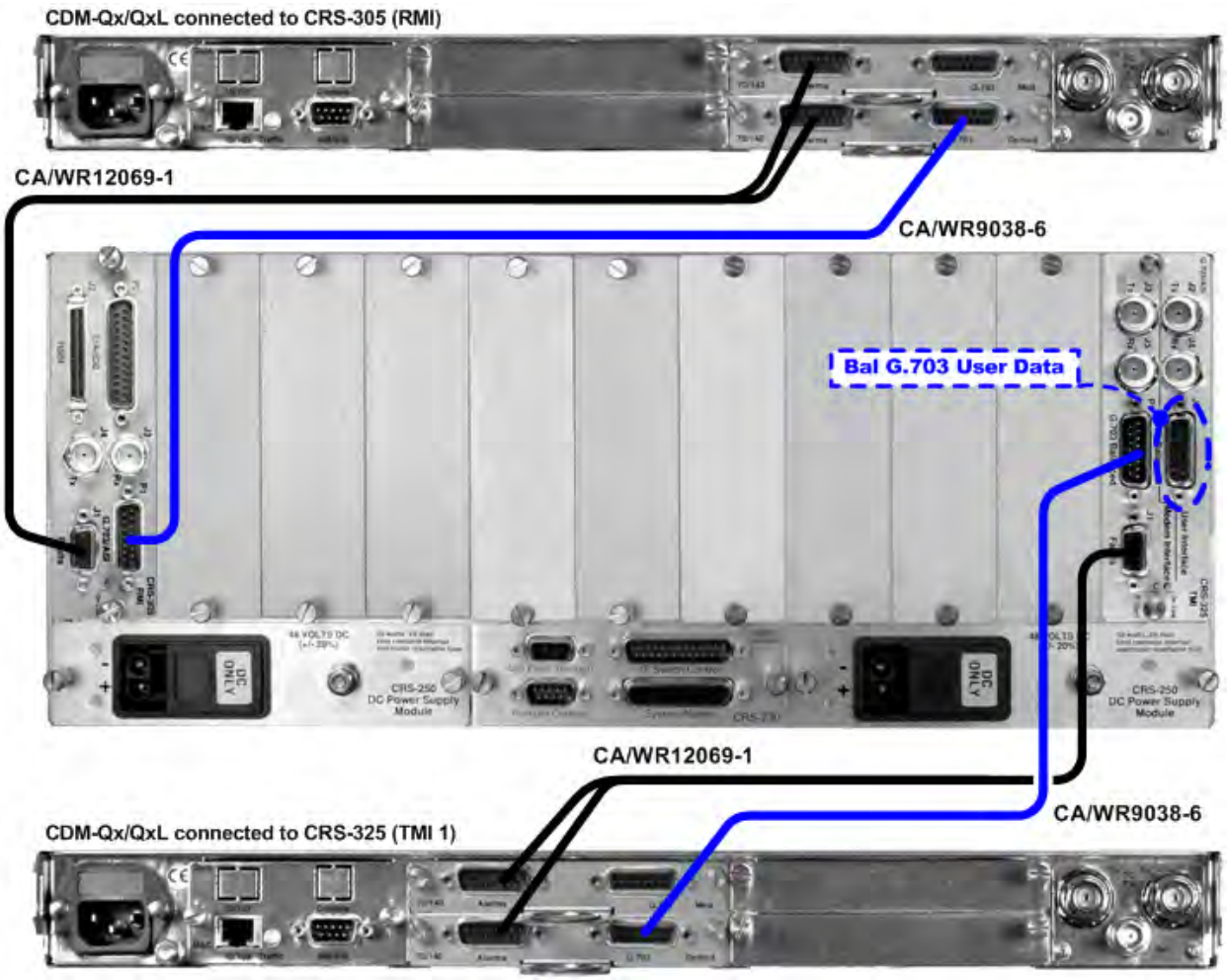


Figure 4-18. Control Y-Cables and Balanced G.703 Data Cables – CRS-300 to CDM-Qx/QxL
(Connections shown for RMI and TMI 1 only)

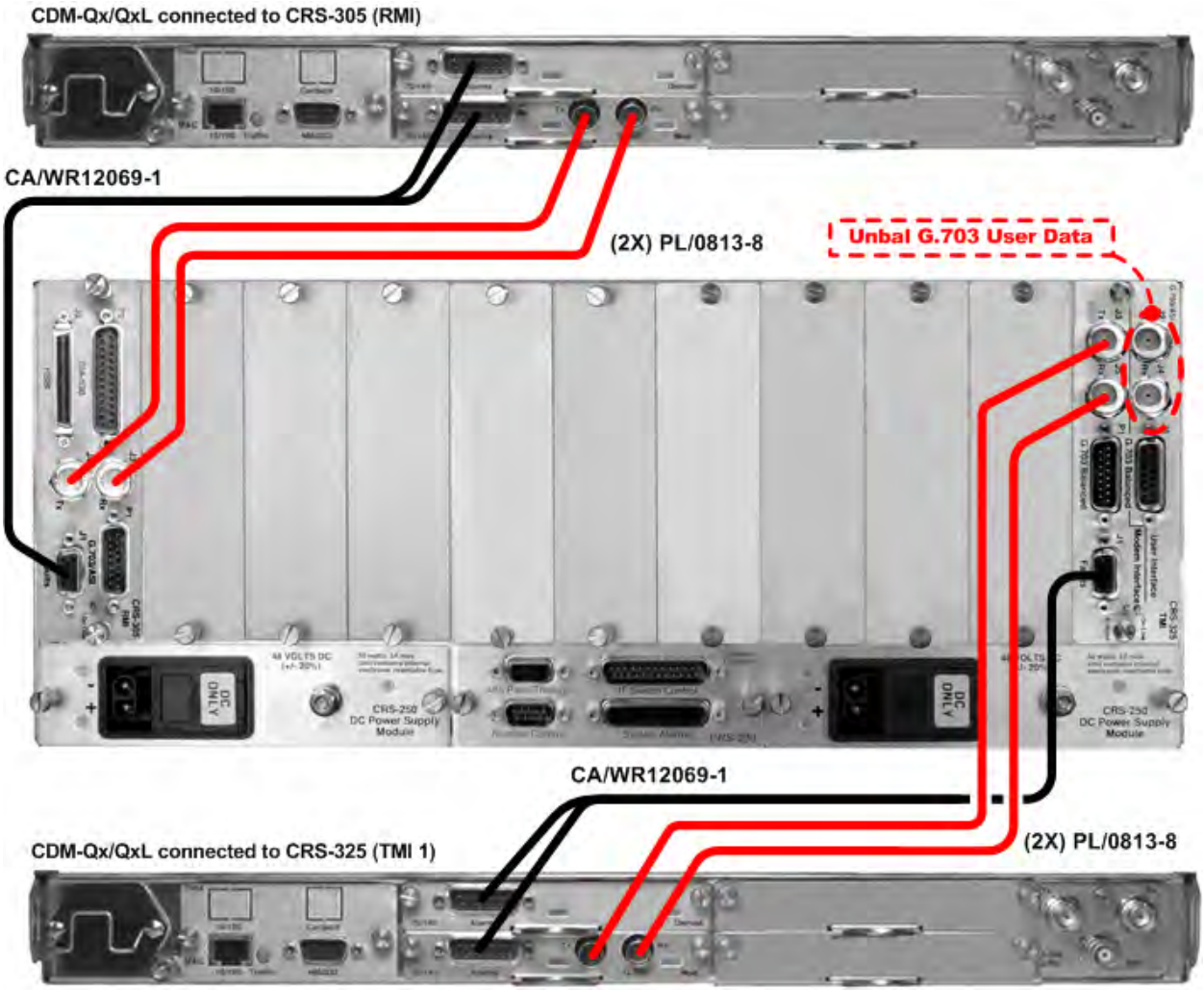


Figure 4-19. Control Y-Cables and Unbalanced G.703 Data Cables – CRS-300 to CDM-Qx/QxL
(Connections shown for RMI and TMI 1 only)

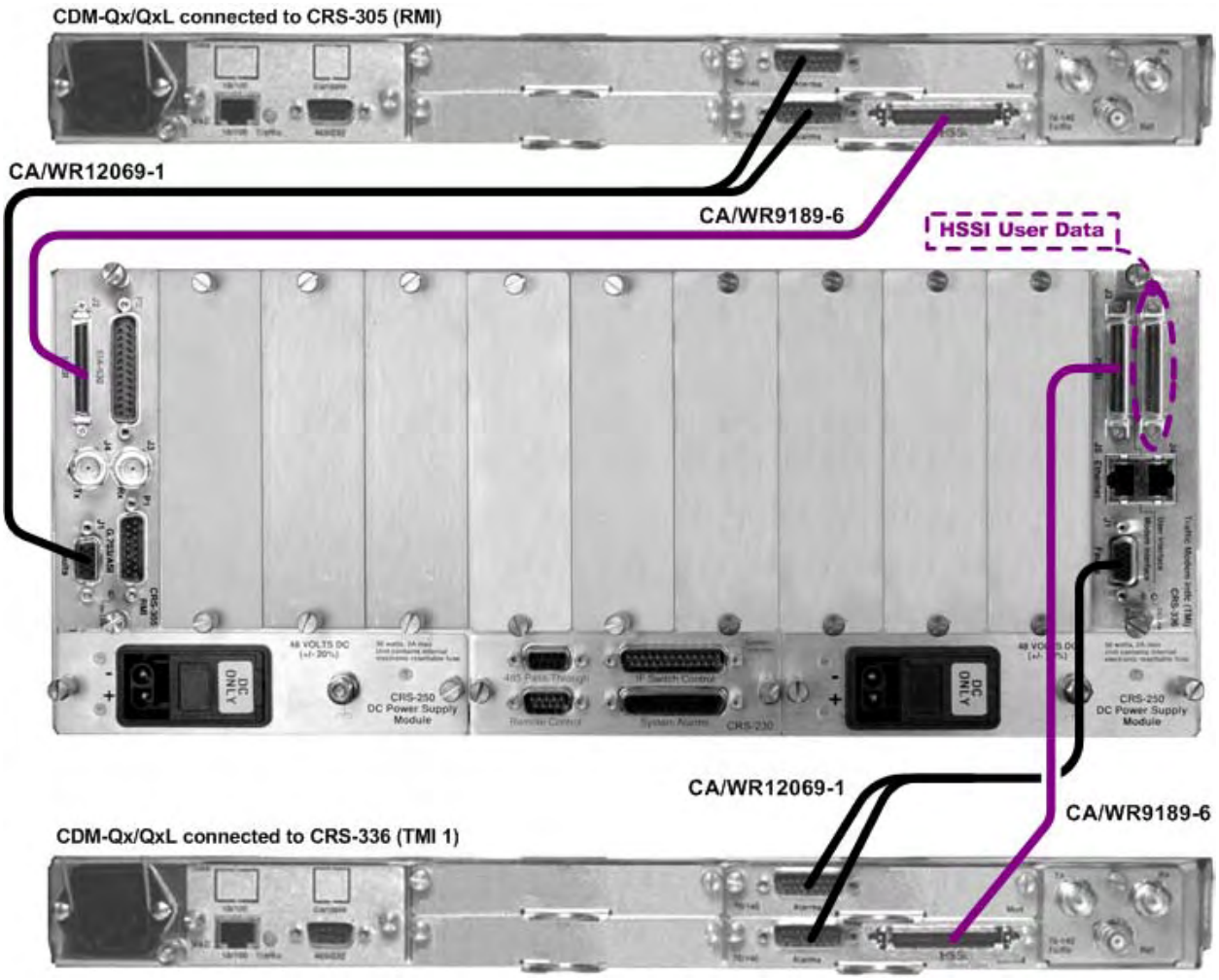


Figure 4-20. Control Cables and HSSI Data Cables – CRS-300 to CDM-Qx/QxL
(Connections shown for RMI and TMI 1 only)

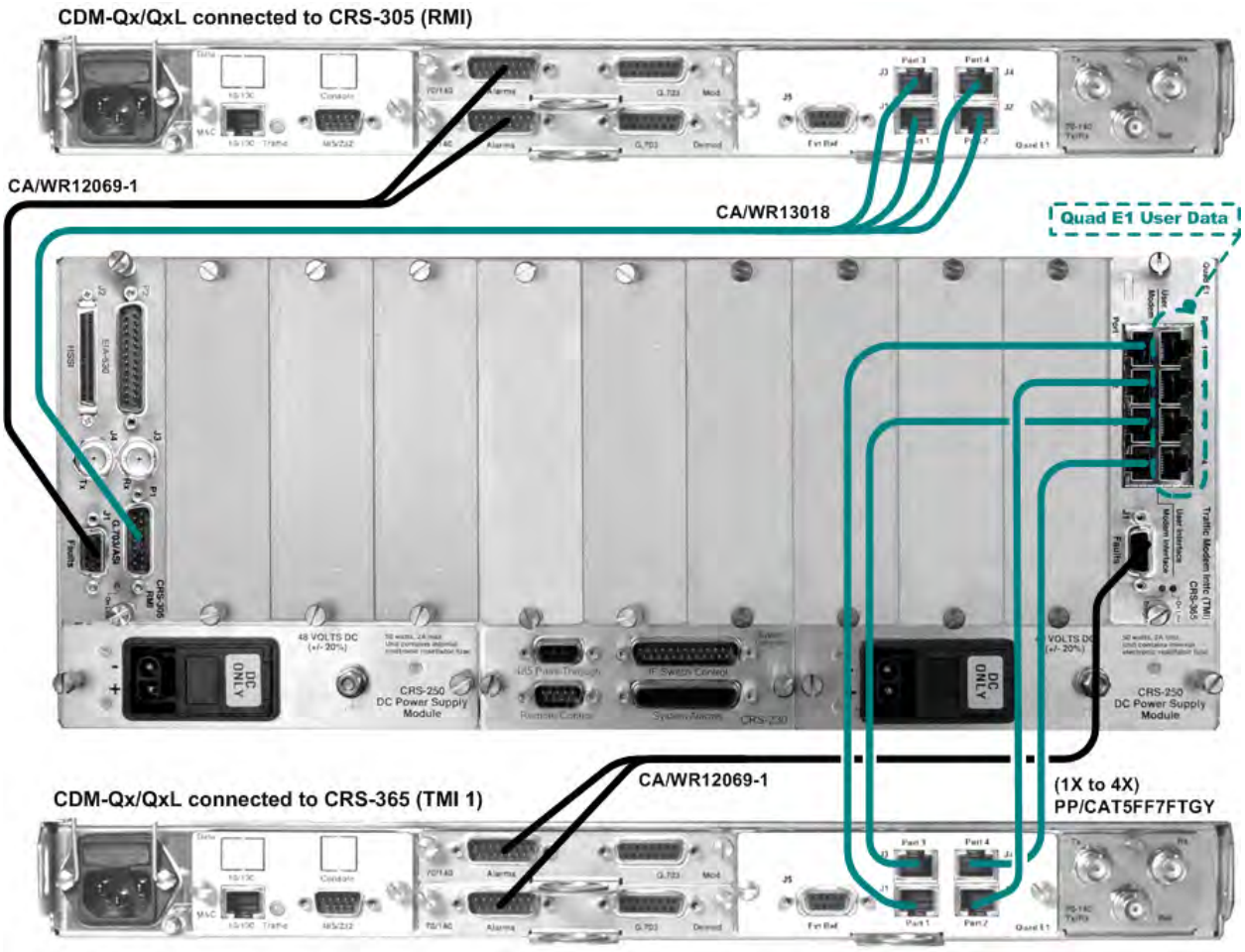


Figure 4-21. Control Cables and Quad E1 Data Cables – CRS-300 to CDM-Qx/QxL
(Connections shown for RMI and TMI 1 only)

4.7 CDM-700 Modem Connections

- **Interface Combinations**
- **Control Cable Connections – CRS-300 to Modems**
- **Serial Traffic Data Connections – CRS-300 to Modems**
- **Ethernet Traffic Data Connections – CRS-300 to Modems**
  - Wired-thru Connections
  - Wired-around Connections
- **User Data Connections – CRS-300 to Users**

4.7 CDM-700 Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing traffic. The cabling, power-up sequence and communication connections must be correct to avoid contention in the system from the modem Tx carrier. This information is detailed in **Chapter 7.4.5 - (CONFIG) ACTIVE MODEMS**.

4.7.1 RMI/TMI Limitations and Considerations

1. ***Traffic modems with differing data types can all be supported by the Redundant Modem.***

IMPORTANT

2. ***Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for HSSI with CA/TA signals using the CRS-336 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information.***

4.7.2 Interface Combinations

With (2) interface card slots available in the CDM-700 modem, there are many possible interface card combinations. The CRS-300 can cover many of these combinations, but not all. **Table 4-2** provides details for the CDM-700 interface card combinations that are compatible with the CRS-300.

Table 4-2. CDM-700 Interface Card Combinations

CDM-700 Modem Configuration		1:N CRS-300 Configuration		Notes
Interface Slot 1	Interface Slot 2	TMI Card	RMI Card	
G.703 (CDI-10)	None	CRS-345	CRS-306	-
	G.703 (CDI-10)	CRS-345	CRS-306	-
	HSSI (CDI-60)	Not Supported	Not Supported	Exceeds backplane capability
	GbE (CDI-70)	CRS-345	CRS-306	Use wired-around GigE (see Chapter 3)
OC3 Copper (CDI-50)	None	CRS-325	CRS-306	-
	GbE (CDI-70)			Valid for Redundant modem
HSSI (CDI-60)	None	CRS-336	CRS-306	-
	HSSI (CDI-60)	None	None	Exceeds backplane capability
	GbE (CDI-70)	CRS-336	CRS-306	Use wired-around GigE (see Chapter 3)
GbE (CDI-70)	None	CRS-336	CRS-306	-
	GbE (CDI-70)			Use wired-around GigE (see Chapter 3)
None	G.703 (CDI-10)	CRS-345	CRS-306	-
	HSSI (CDI-60)	CRS-336		-
	GbE (CDI-70)			-

Notes:

1. The Redundant CDM-700 must have the same interface cards in each slot as any of the Traffic CDM-700s.

2. The Traffic CDM-700 must have the same interface cards in each slot as any of the other Traffic CDM-700s have, or a blank panel installed.
3. OC3 Optical TMI is not currently available.
4. As of April 2007:
    - CRS-336 TMI card replaces the CRS-335.
    - CRS-306 RMI card replaces the CRS-305.

4.7.3 Control Cable Connections – CRS-300 to Modems

The Control Cable CA/WR12361-1 provides the serial communication path between the Switch and the modems and controls the modem's external Tx IF-mute control line, and is therefore always required.

Refer to **Figure 4-22** and **Figure 4-23** to connect and secure the CA/WR12361-1 cables between the CRS-300 and each CDM-700 as follows:

- HD-15F connector labeled "J1" on the RMI or TMI(s), to
- DB-15M connector labeled "P1 Alarms" on the CDM-700.

4.7.4 Serial Traffic Data Connections – CRS-300 to Modems

If G.703 is the traffic data type, refer to **Figure 4-22**, **Figure 4-23**, **Figure 4-25**, or **Figure 4-27** to connect and secure the Traffic Data Cables CA/RF12278-1 and CA/RF12279-1 the CRS-300 and each CDM-700 as follows:

First, connect and secure the CA/RF12279-1 cable between the Redundant CDM-700 and the CRS-300:

- DB-15M connector labeled "P1" on the RMI, to
- BNC connectors (<4X> per installed CDI-10 card) on the Redundant CDM-700 (depending on the modem configuration, either <4X> or<8X> BNC connectors are used).

Next, connect and secure the CA/RF12278-1 cables between the CRS-300 and the Traffic CDM-700(s):

- DB-9M connector labeled "P1" on the TMI(s), to
- BNC connectors (4X per installed CDI-10 card) on each Traffic CDM-700 (depending on the modem configuration, either <4X> or <8X> BNC connectors are used).

If HSSI is the traffic data type, refer to **Figure 4-23** and **Figure 4-26** to connect and secure the HSSI Data Cable CA/WR9189-6 between the CRS-300 and each CDM-700 as follows:

- HSSI (HD-50F) connector labeled "J2" on the RMI, or "J3" on the TMI(s), to
- HSSI (HD-50F) connector labeled "HSSI" on each CDM-700.

If OC3 copper is the traffic data type, refer to **Figure 4-24** to connect and secure the pair of BNC PL/0813-8 cables between the CRS-300 and each CDM-700 as follows:

- BNC connectors labeled "J4 Tx" on the RMI, or "J3 Tx"on the TMI(s), to BNC connectors labeled "Tx" on the CDM-700's CDI-50 interface card, and
- BNC connectors labeled "J3 Rx" on the RMI, or "J5 Rx"on the TMI(s), to BNC connectors labeled "Rx" on the CDM-700's CDI-50 interface card.

4.7.5 Ethernet Traffic Data Connections - CRS-300 to Modems

To handle Ethernet traffic data, the User has two choices:

- If the Traffic Modem uses Ethernet **as the only data type needed**, then the Ethernet data should be routed *through* the CRS-300 Switch like G.703 or HSSI data. This method of processing data through the CRS-300 is referred to as **wired-thru**.
- If the Traffic Modem uses Ethernet **and another data type** like G.703 or HSSI, then the Ethernet data can be routed *around* the CRS-300. This method of processing data around the CRS-300 is referred to as **wired-around.**

For detailed information on these two approaches, refer to **Chapter 3. ETHERNET NETWORK CONFIGURATIONS** in this manual.

4.7.5.1 Wired-thru Connections

For the wired-thru connection, refer to **Figure 4-24** and **Figure 4-25** to connect and secure the Cat5 Data Cable PP/CAT5FF7FTGY between the CRS-300 and each CDM-700 as follows:

- RJ-45 connector labeled "J5" on the RMI or TMI(s), to
- RJ-45 connector labeled "J1" on the CDM-700 (CDI-70) interface cards.

4.7.5.2 Wired-around Connections

For the wired-around connection, refer to **Figure 4-26** and **Figure 4-27** to connect and secure the Cat5 Data Cable PP/CAT5FF7FTGY for each CDM-700 as follows:

- RJ-45 connector labeled "J1" on the CDM-700 (CDI-70) interface card, to
- RJ-45 connector on the User-provided Ethernet switch

4.7.6 User Data Connections – CRS-300 to User

The User's traffic data (from an external router, multiplexing equipment or test data generator) should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic CDM-700's "Data Interface" connectors.

If the User chooses to wire-around for Ethernet traffic, the User traffic interface will be on the customer provided switch.

Because the Redundant CDM-700's function is to replace a faulted Traffic CDM-700, the RMI does not have a User Data Interface.

Refer to **Chapter 1.4.4 Modem Interface Cards** for detailed information on the RMI and TMI cards available for use with the CDM-700 modems.

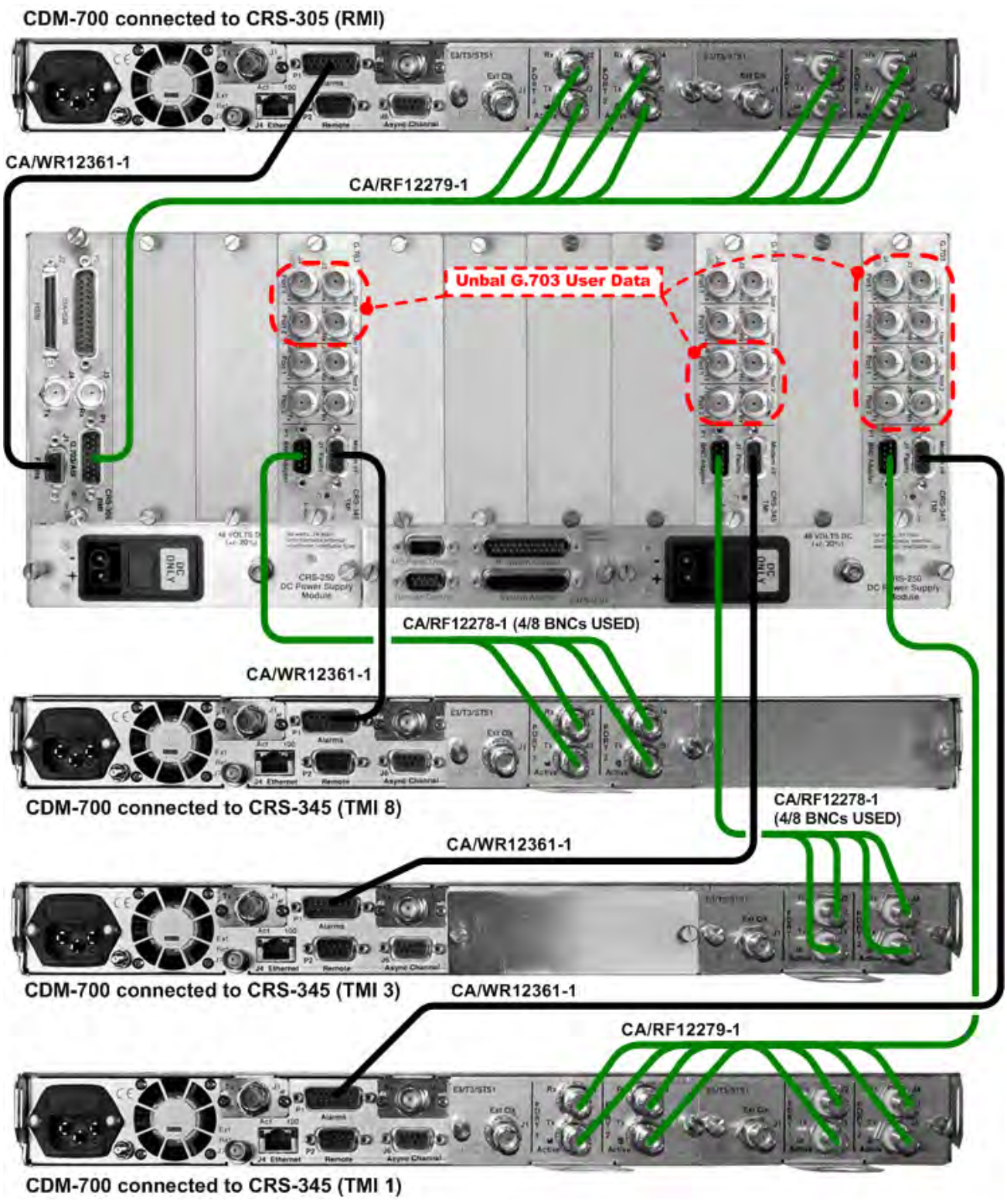


Figure 4-22. Control and Traffic Data Cables Example #1 – CRS-300 to CDM-700
(Connections shown for RMI and TMIs 1, 3, and 8 only)

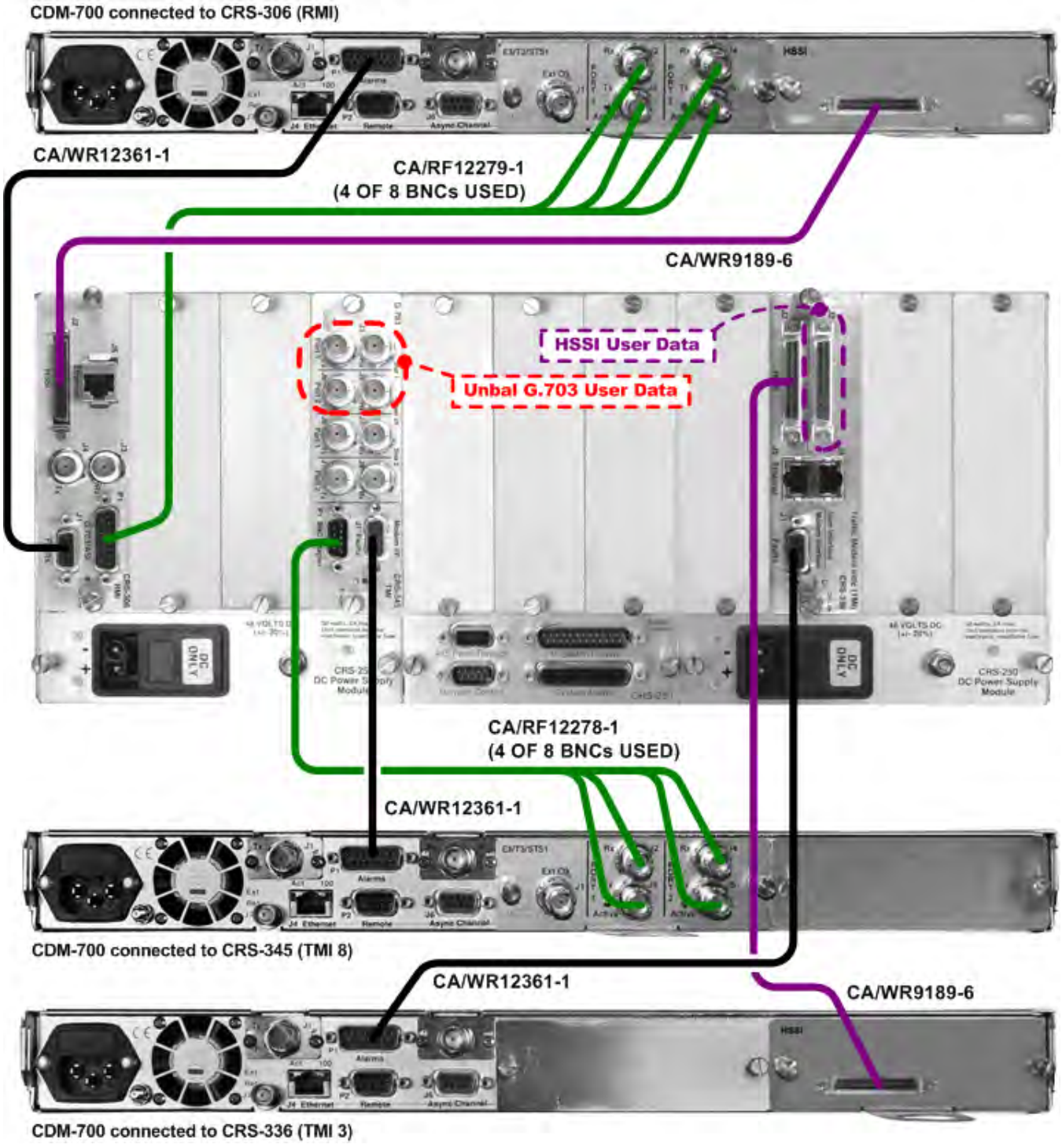


Figure 4-23. Control and Traffic Data Cables Example #2 – CRS-300 to CDM-700
(Connections shown for RMI and TMIs 3 and 8 only)

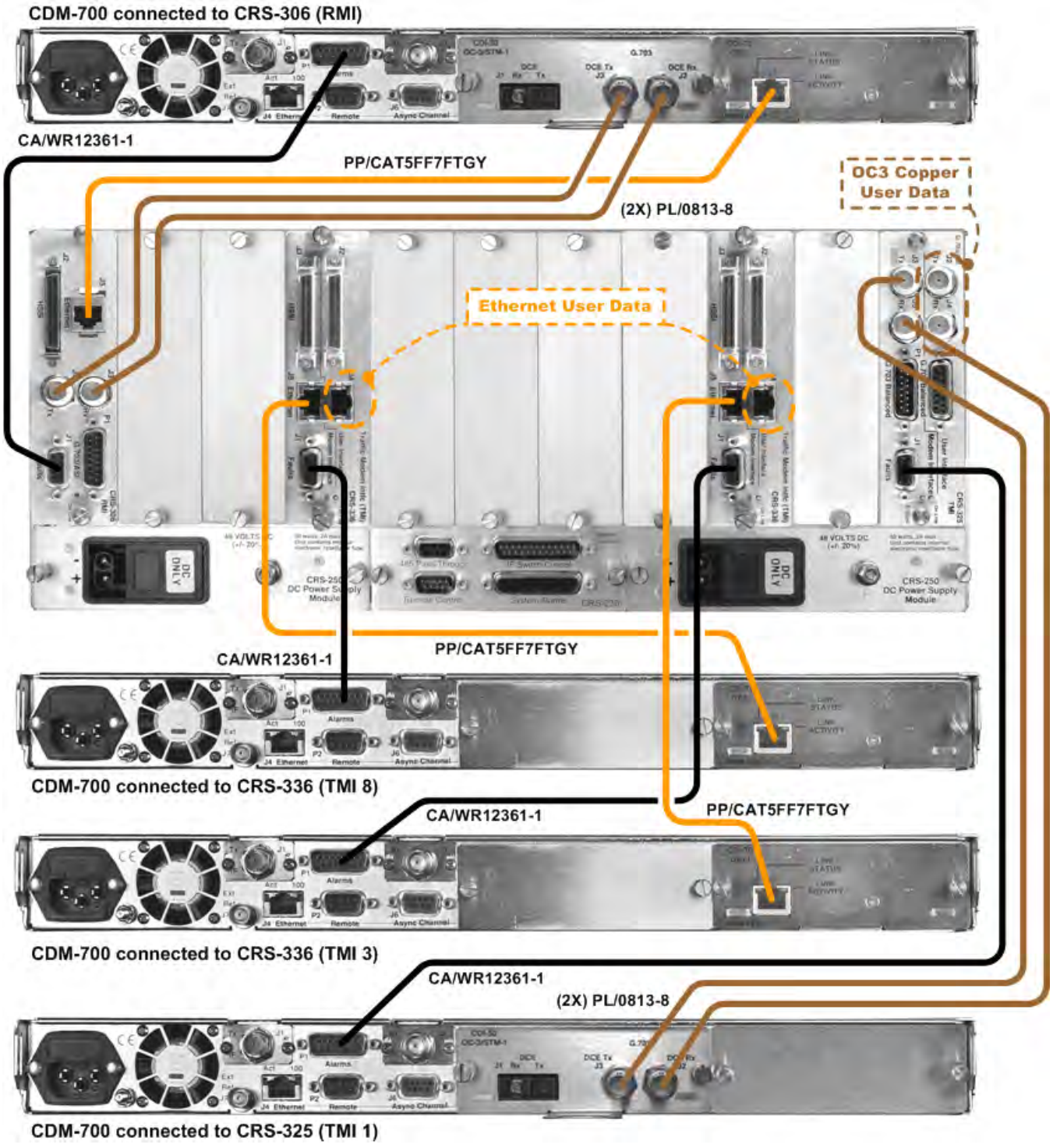


Figure 4-24. CDM-700 IP Connections – Wired-thru Example #1
(Connections shown for RMI and TMIs 1, 3, and 8 only)

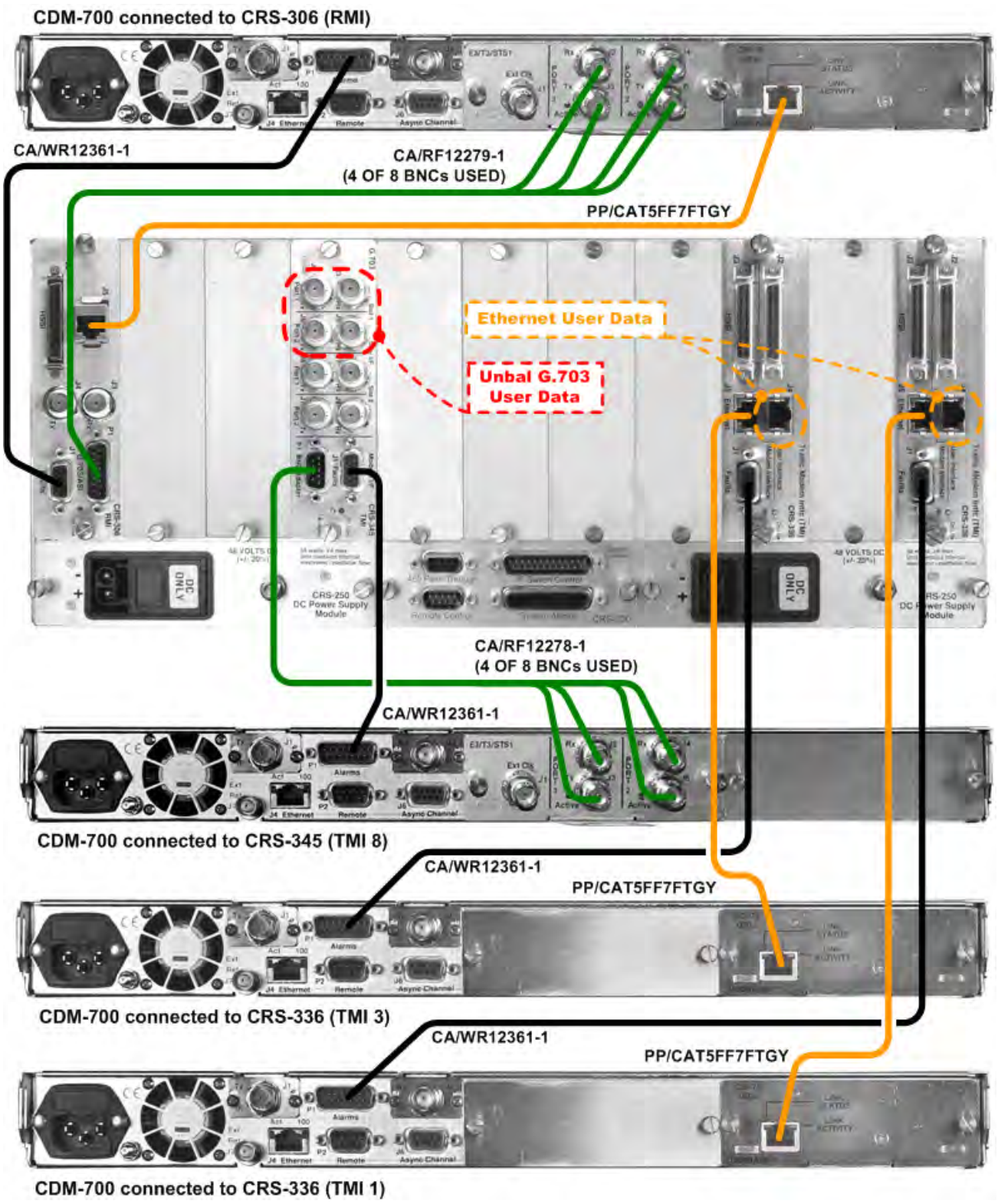


Figure 4-25. CDM-700 IP Connections – Wired-thru Example #2
(Connections shown for RMI and TMIs 1, 3, and 8 only)

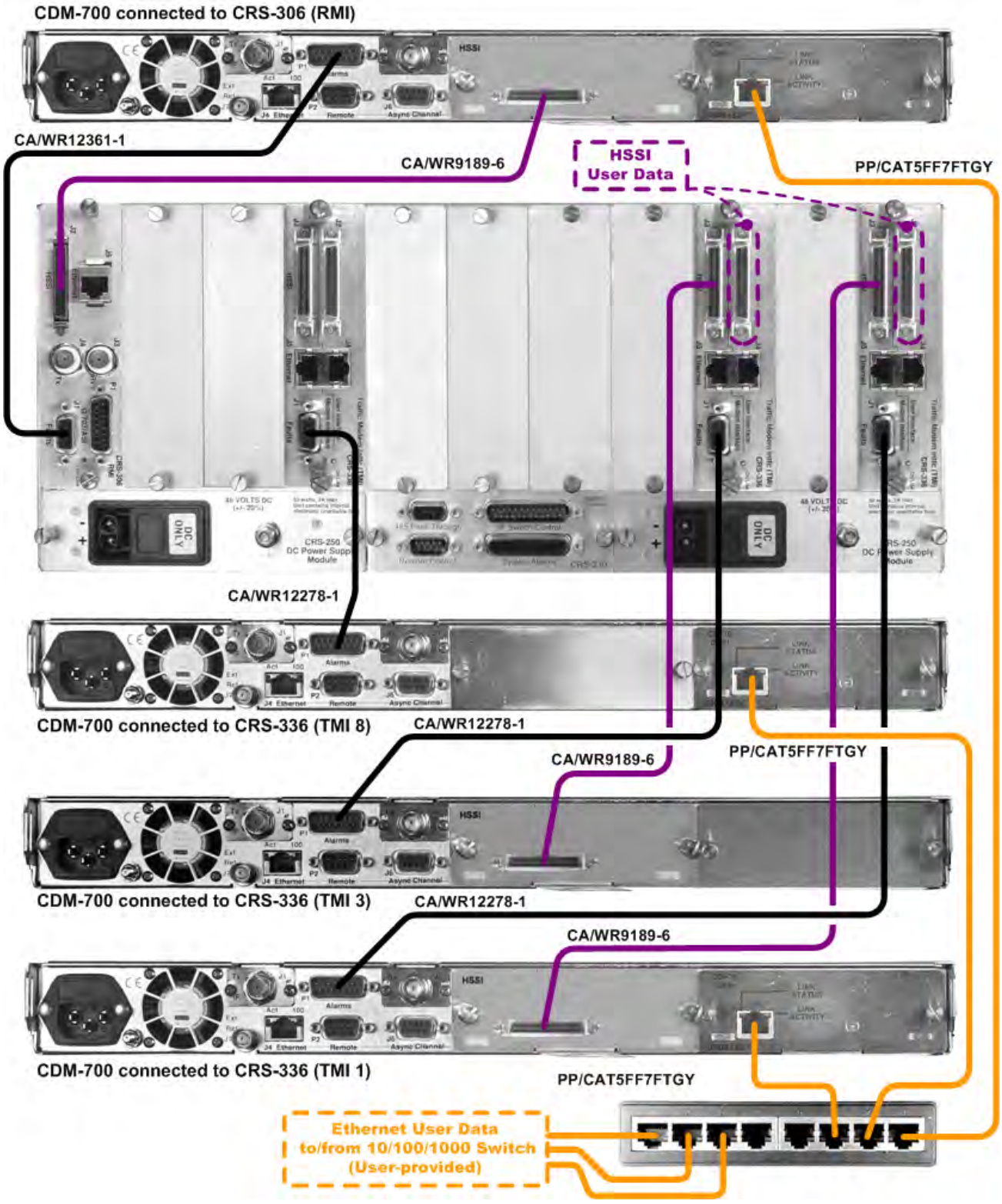


Figure 4-26. CDM-700 IP Connections – Wired-around Example #1
(Connections shown for RMI and TMIs 1, 3, and 8 only)

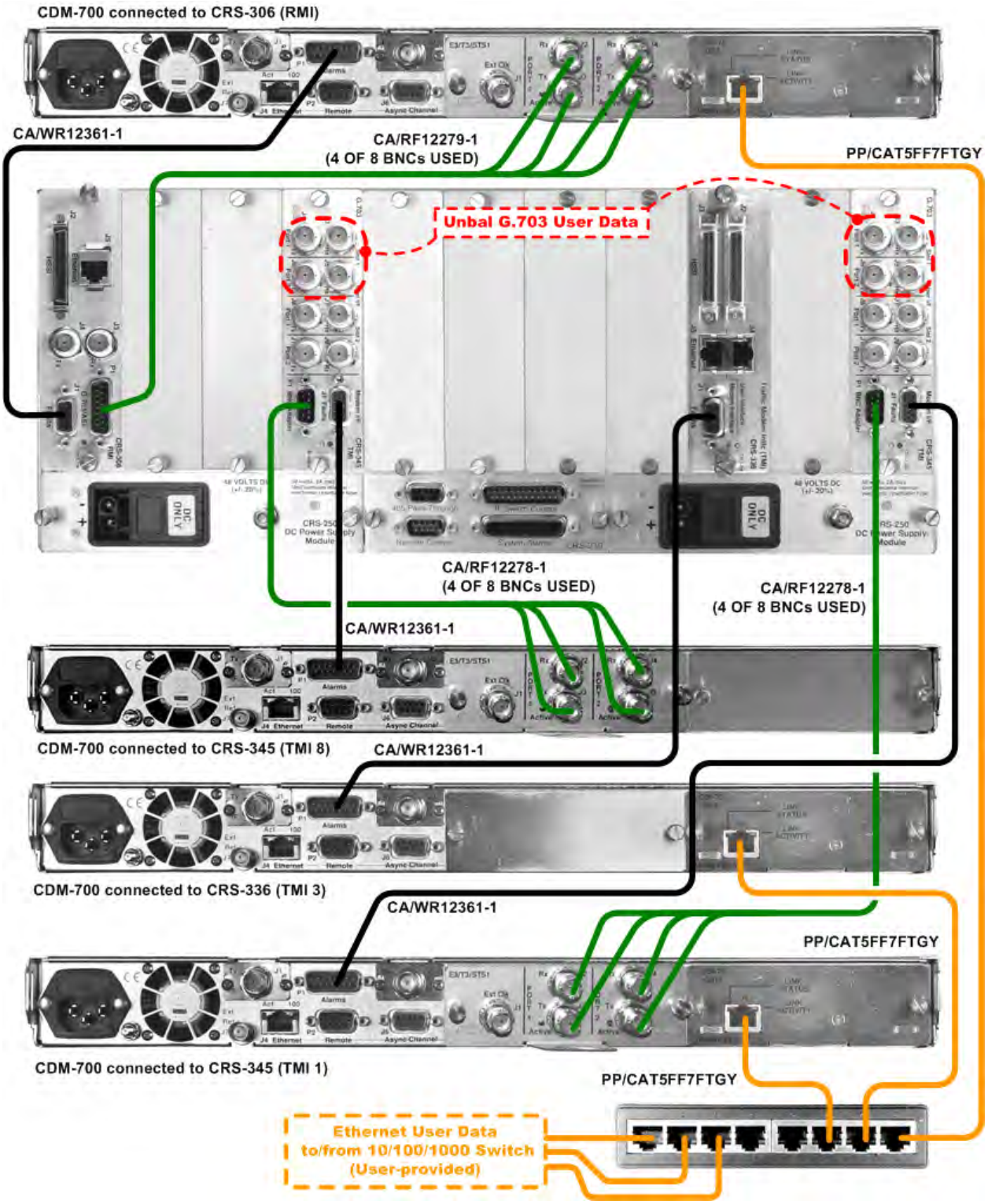


Figure 4-27. CDM-700 IP Connections – Wired-around Example #2
(Connections shown for RMI and TMIs 1, 3, and 8 only)

4.8 CDM-710 Modem Connections

- **Interface Combinations**
- **Control Cable Connections – CRS-300 to Modems**
- **Serial Traffic Data Connections – CRS-300 to Modems**
- **Ethernet Traffic Data Connections – CRS-300 to Modems**
- **User Data Connections – CRS-300 to Users**

4.8 CDM-710 Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing traffic. The cabling, power-up sequence and communication connections must be correct to avoid contention in the system from the modem Tx carrier. This information is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

4.8.1 RMI/TMI Limitations and Considerations

IMPORTANT

1. ***Traffic modems with differing data types are not supported by the Redundant Modem. For example, the CRS-300 can* not *be populated with Traffic modems with ASI and Traffic modes with HSSI.***
2. ***Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for HSSI with CA/TA signals using the CRS-336 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information.***

4.8.2 Interface Combinations

With (2) interface card slots available in the CDM-710 modem, there are many possible interface card combinations. The CRS-300 can cover many of these combinations, but not all. capability is limited by the CRS-300's backplane configuration. For example, if the CRS-300's backplane is configured to handle one HSSI interflow, then the supported Redundant and Traffic modems are limited to one HSSI interface per unit as well. **Table 4-3** provides details for the CDM-710 interface card combinations that are compatible with the CRS-300.

Table 4-3. CDM-710 Interface Card Combinations

CDM-710 Modem Configuration		1:N CRS-300 Configuration		Notes
Interface Slot 1	Interface Slot 2	TMI Card	RMI Card	
ASI (CDI-40)	None	CRS-325	CRS-306	-
ASI (CDI-40)	GbE (CDI-70)			Can be used as Redundant Modem
HSSI (CDI-60)	None	CRS-336	CRS-306	-
None	GbE (CDI-70)			-
HSSI (CDI-60)	GbE (CDI-70)			Can be used as Redundant Modem

Notes:

1. The Redundant Modem must have the same interface cards in each slot as any of the Traffic Modems.
2. The Traffic Modem must have the same interface cards in each slot as any of the other Traffic Modems have, or a blank panel installed.
3. **Interface Slots 1 and 2 are not active simultaneously**.

4.8.3 Control Cable Connections – CRS-300 to Modems

The Control Cable CA/WR12361-1 provides the serial communication path between the Switch and the modems and controls the modem's external Tx IF-mute control line, and is therefore always required.

Refer to **Figure 4-28** and **Figure 4-29** to connect and secure the CA/WR12361-1 cables between each CDM-710 and the CRS-300 as follows:

- HD-15F connector labeled "J1" on the RMI or TMI(s), to
- DB-15M connector labeled "P1 Alarms" on the CDM-710.

4.8.4 Serial Traffic Data Connections – CRS-300 to Modems

If ASI is the traffic data type, refer to **Figure 4-28** to connect and secure the pair of BNC PL/0813-8 cables between the CRS-300 and each CDM-710 as follows:

- BNC connectors labeled "J4 Tx" on the RMI or "J3 Tx"on the TMI(s) to BNC connectors labeled "Tx J4" on the CDM-710's CDI-40 interface card, to
- BNC connectors labeled "J3 Rx" on the RMI or "J5 Rx"on the TMI(s) to BNC connectors labeled "Rx J2" on the CDM-710's CDI-40 interface card.

If HSSI is the traffic data type, refer to **Figure 4-29** to connect and secure the HSSI Data Cable CA/WR9189-6 between the CRS-300 and each CDM-710 as follows:

- HSSI (HD-50F) connector labeled "J2" on the RMI or "J3" on the TMI(s), to
- HSSI (HD-50F) connector labeled "J1 HSSI" on the CDM-710's CDI-60 interface card.

4.8.5 Ethernet Traffic Data Connections - CRS-300 to Modems

To handle Ethernet traffic data, the User routes the Ethernet data *through* the CRS-300 Switch like G.703 or HSSI data. This method of processing data through the CRS-300 is referred to as **wired-thru**. For detailed information on this method, refer to **Chapter 3. ETHERNET NETWORK CONFIGURATIONS** in this manual.

For the wired-thru connection, refer to **Figure 4-29** to connect and secure the Cat5 Data Cable PP/CAT5FF7FTGY (RJ-45 to RJ-45, 7') between the CRS-300 and each CDM-710 as follows:

- RJ-45 connector labeled "J5" on the RMI or TMI(s), to
- RJ-45 connector labeled "J1" on the CDM-700 (CDI-70) interface card.

4.8.6 User Data Connections – CRS-300 to User

The User's traffic data (from an external router, multiplexing equipment or test data generator) should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface. Refer to **Chapter 1.4.4 Modem Interface Cards** for detailed information on the RMI and TMI cards available for use with the CDM-710 modems.

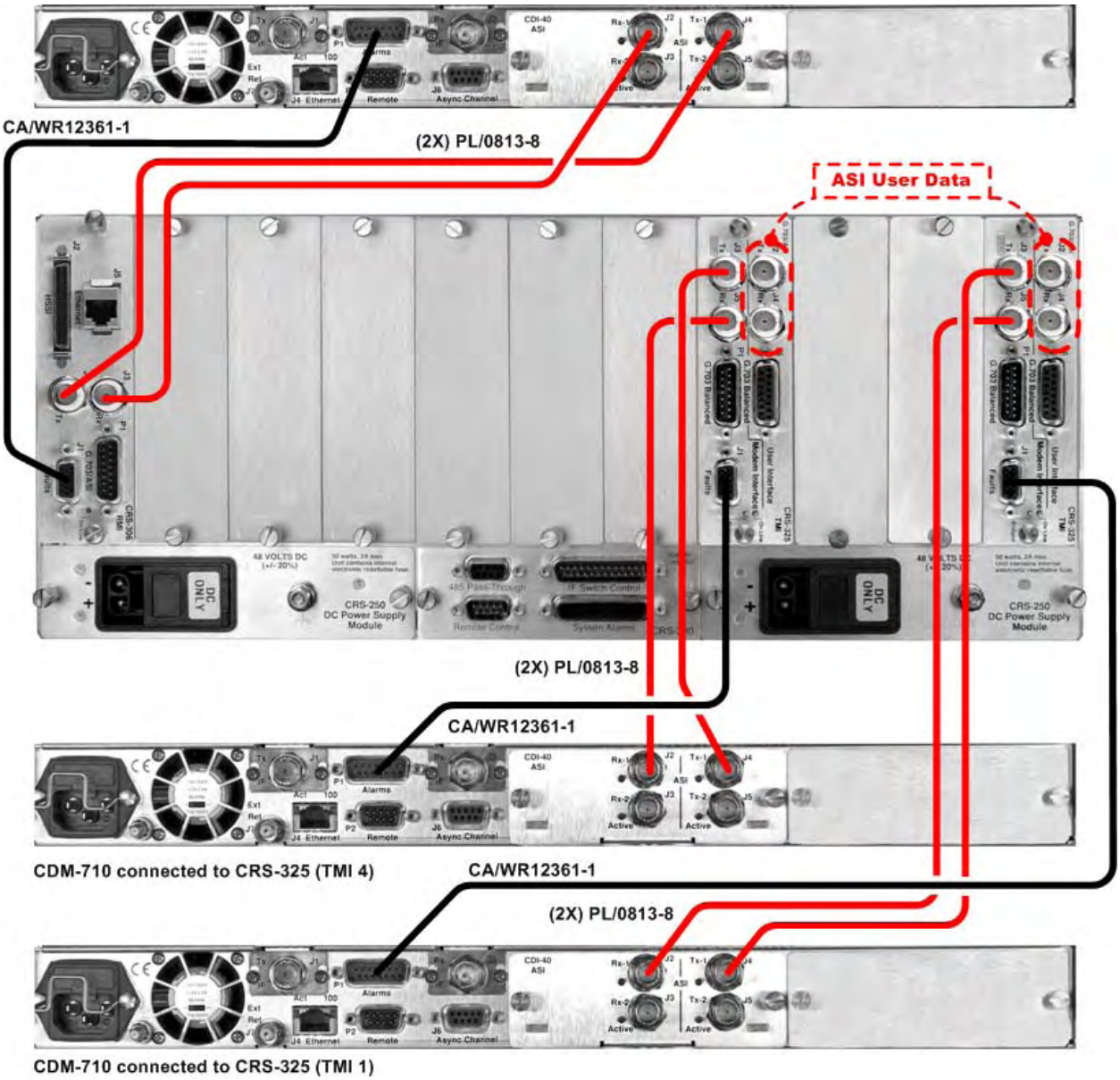


Figure 4-28. Control and Data Cables Example #1 – CRS-300 to CDM-710
(Connections shown for RMI & TMIs 1 and 3 only)

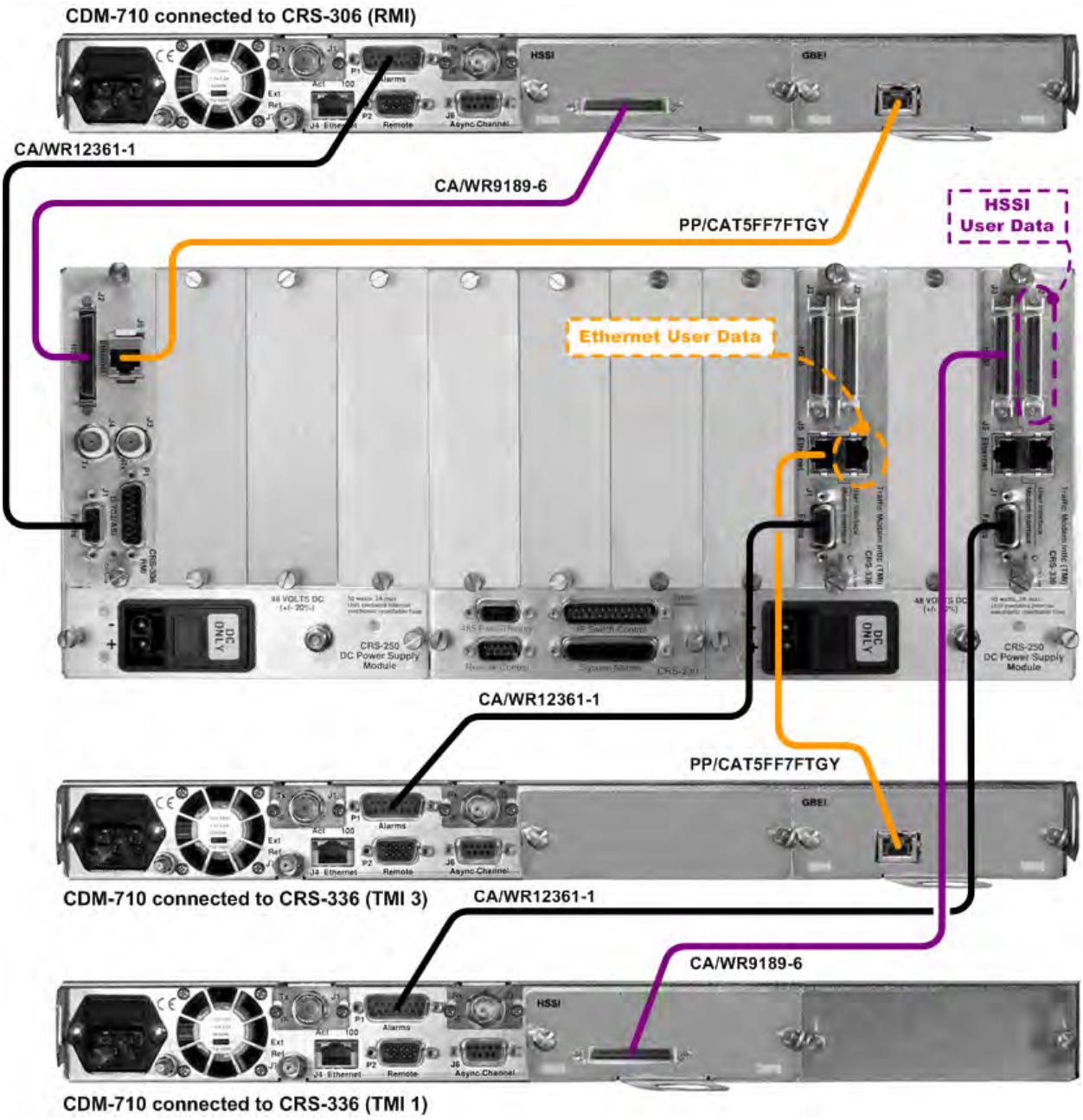


Figure 4-29. Control and Data Cables Example #2 – CRS-300 to CDM-710
(Connections shown for RMI & TMIs 1 and 3 only)

Notes:

4.9 CDM-710G Modem Connections

- **Interface Combinations**
- **Control Cable Connections – CRS-300 to Modems**
- **Serial Traffic Data Connections – CRS-300 to Modems**
- **Ethernet Traffic Data Connections – CRS-300 to Modems**
- **User Data Connections – CRS-300 to Users**

4.9 CDM-710G Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing traffic. The cabling, power-up sequence and communication connections must be correct to avoid contention in the system from the modem Tx carrier. This information is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

4.9.1 RMI/TMI Limitations and Considerations

IMPORTANT

1. ***Traffic modems with differing data types are not supported by the Redundant Modem. For example, the CRS-300 can not be populated with Traffic modems with ASI and Traffic modes with HSSI.***
2. ***Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for HSSI with CA/TA signals using the CRS-336 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information***

4.9.2 Interface Combinations

With (2) interface card slots available in the CDM-710G modem, there are several possible interface card combinations. **Table 4-4** provides details for the CDM-710G interface card combinations that are compatible with the CRS-300.

Table 4-4. CDM-710G Interface Card Combinations

CDM-710G Unit Configuration		1:N CRS-300 Configuration		Notes
Interface Slot 1	Interface Slot 2	TMI Card	RMI Card	
G.703 (CDI-10-1)	None	CRS-325	CRS-306	-
G.703 (CDI-10-1)	GigE (CDI-70)			Can be used as Redundant Unit
HSSI (CDI-60)	None	CRS-336		-
None	GigE (CDI-70)		CRS-306	-
HSSI (CDI-60)	GigE (CDI-70)			Can be used as Redundant Unit

Notes:

1. The Redundant Modem must have the same interface cards in each slot as any of the Traffic Modems.
2. The Traffic Modem must have the same interface cards in each slot as any of the other Traffic Modems have, or a blank panel installed.
3. **Interface Slots 1 and 2 are not active simultaneously**.

4.9.3 Control Cable Connections – CRS-300 to Modems

The Control Cable CA/WR12361-1 provides the serial communication path between the Switch and the modems and controls the modem's external Tx IF-mute control line, and is therefore always required.

Refer to **Figure 4-30** and **Figure 4-31** to connect and secure the CA/WR12361-1 cables between each CDM-710G and the CRS-300 as follows:

- HD-15F connector labeled "J1" on the RMI or TMI(s), to
- DB-15M connector labeled "P1 Alarms" on the CDM-710G.

4.9.4 Serial Traffic Data Connections – CRS-300 to Modems

If G.703 is the traffic data type, refer to **Figure 4-30** to connect and secure the pair of BNC PL/0813-8 cables between the CRS-300 and each CDM-710G as follows:

- BNC connectors labeled "J4 Tx" on the RMI or "J3 Tx"on the TMI(s) to BNC connectors labeled "Tx J3" on the CDM-710G's CDI-10-1 interface card, to
- BNC connectors labeled "J3 Rx" on the RMI or "J5 Rx"on the TMI(s) to BNC connectors labeled "Rx J2" on the CDM-710G's CDI-10-1 interface card.

If HSSI is the traffic data type, refer to **Figure 4-31** to connect and secure the HSSI Data Cable CA/WR9189-6 the CRS-300 and each CDM-710G as follows:

- HSSI (HD-50F) connector labeled "J2" on the RMI or "J3" on the TMI(s), to
- HSSI (HD-50F) connector labeled "J1 HSSI" on the CDM-710G's CDI-60 interface card.

4.9.5 Ethernet Traffic Data Connections - CRS-300 to Modems

To handle Ethernet traffic data, the User routes the Ethernet data *through* the CRS-300 Switch like G.703 or HSSI data. This method of processing data through the CRS-300 is referred to as **wired-thru**. For detailed information on this method, refer to **Chapter 3. ETHERNET NETWORK CONFIGURATIONS** in this manual.

For the wired-thru connection, refer to **Figure 4-31** to connect and secure the Cat5 Data Cable PP/CAT5FF7FTGY (RJ-45 to RJ-45, 7') between the CRS-300 and each CDM-710G as follows:

- RJ-45 connector labeled "J5" on the RMI or TMI(s), to
- RJ-45 connector labeled "J1" on the CDM-700 (CDI-70) interface card.

4.9.6 User Data Connections – CRS-300 to User

The User's traffic data (from an external router, multiplexing equipment or test data generator) should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface. Refer to **Chapter 1.4.4 Modem Interface Cards** for detailed information on the RMI and TMI cards available for use with the CDM-710G modems.

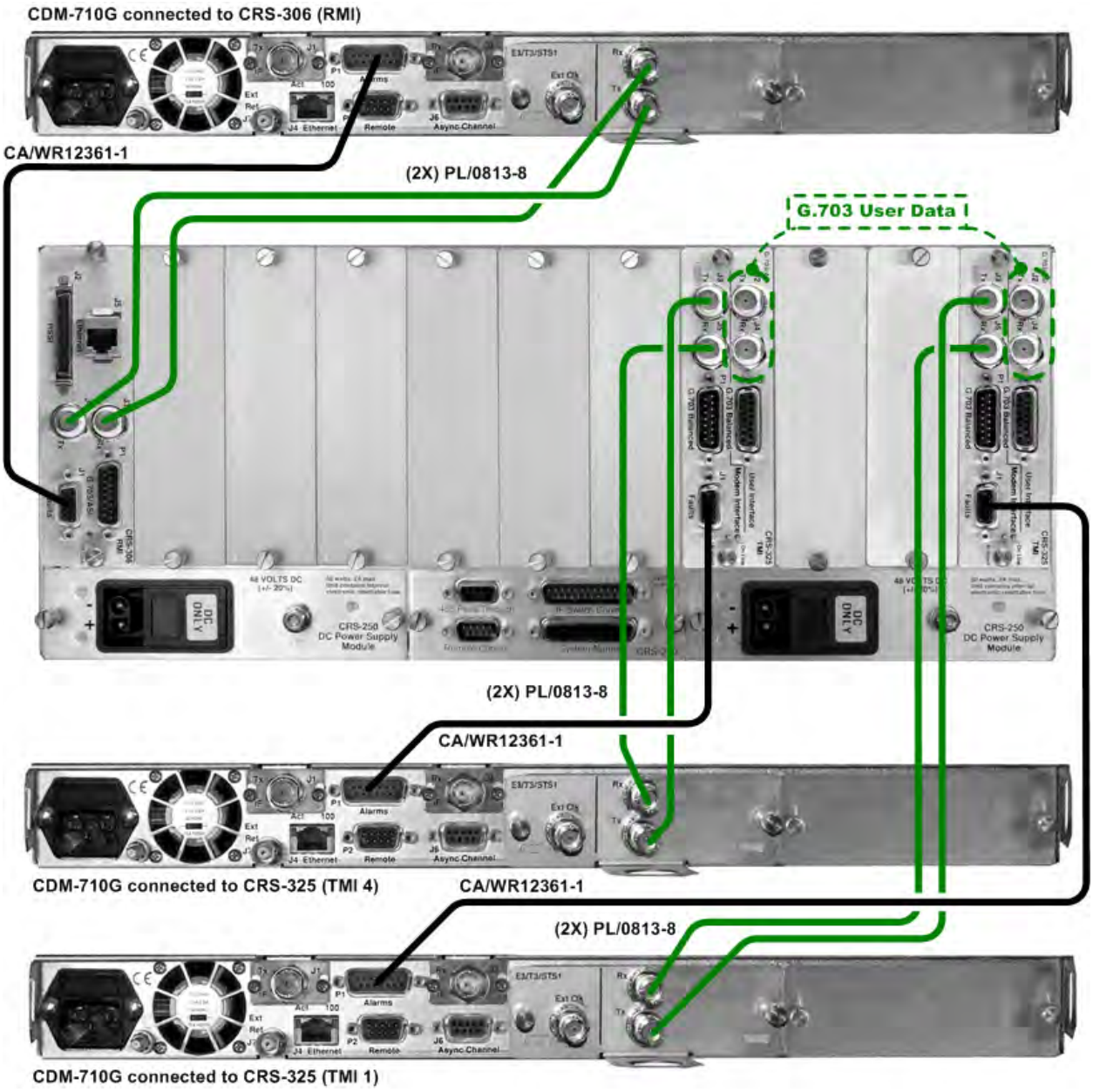


Figure 4-30. Control and Data Cables Example #1 – CRS-300 to CDM-710G
(Connections shown for RMI & TMIs 1 and 3 only)

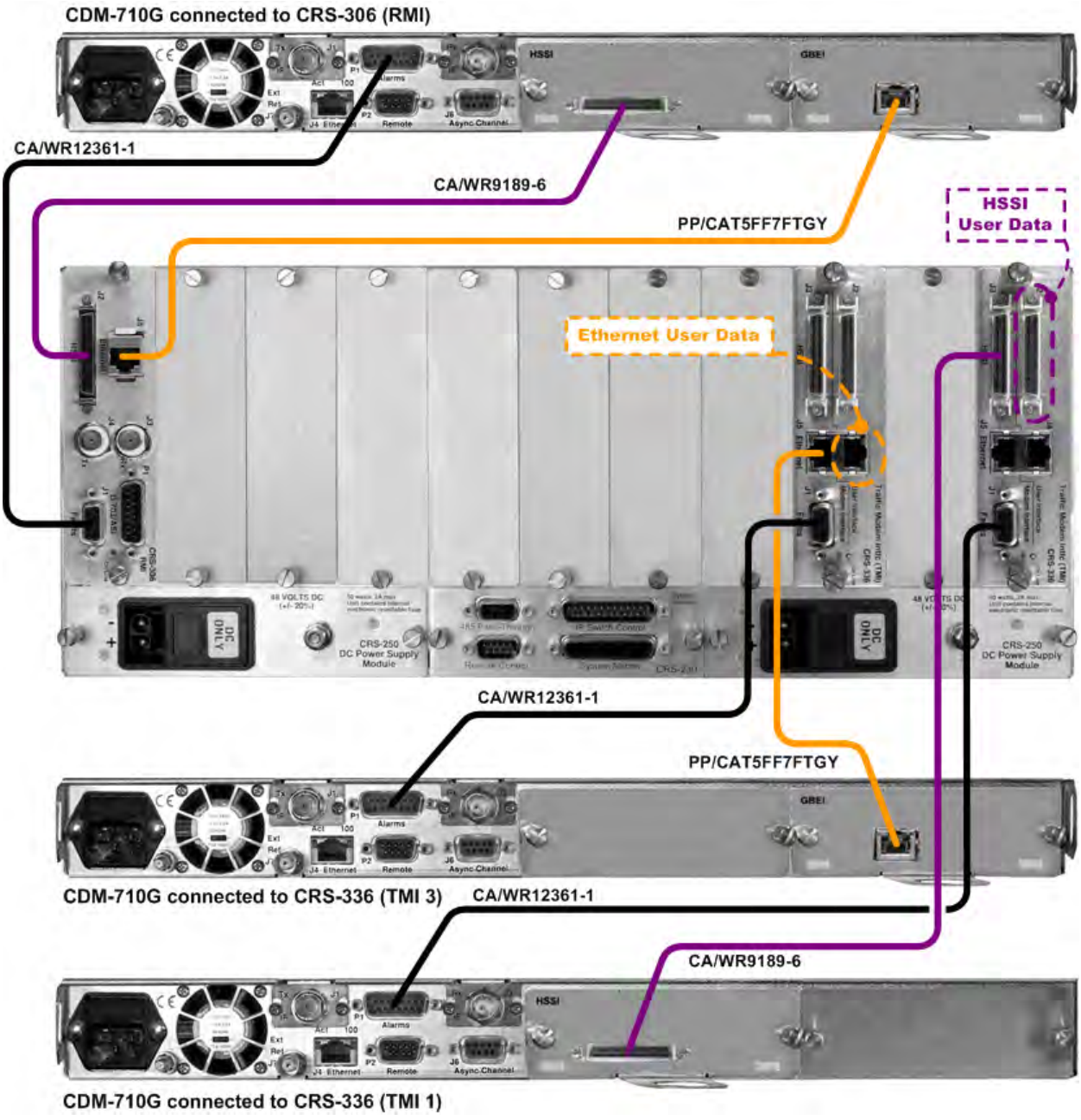


Figure 4-31. Control and Data Cables Example #2 – CRS-300 to CDM-710G
(Connections shown for RMI & TMIs 1 and 3 only)

Notes:

4.10 SLM-5650/5650A Modem Connections

- **Control Cable Connections – CRS-300 to Modems**
- **Traffic Data Connections – CRS-300 to Modems**
- **Ethernet Traffic Data Connections – CRS-300 to Modems**
- **User Data Connections – CRS-300 to User**
- **ESC Data Connections – CRS-350 to Modems**
- **User ESC Data Connections – CRS-350 to User**

4.10 SLM-5650/5650A Modem Connections

If adding a modem to an ***operating*** 1:N system, care needs to be taken to not interfere with the existing Traffic Modem. The cabling, power-up sequence, and communication connections must be correct to avoid contention in the system from the modem Tx carrier. This information is detailed in **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

4.10.1 RMI/TMI Limitations and Considerations

Some consideration must be made when choosing which TMIs can be mixed within the same CRS-300. Because the RMIs (CRS-306/-307) cannot provide connections to all of the data types on the SLM-5650/5650A Redundant Modem, the customer must choose which RMI card is the best choice for use with the CRS-300 Redundancy switch. This will then dictate which TMIs that the CRS-300 can support.

IMPORTANT

1. ***The Redundant Modem shall have the same option card as any Traffic Modem.***
2. ***Depending on the traffic data type, the appropriate jumper settings are provided on the TMI to ensure proper operation for EIA-422 with RTS/CTS, DTR/DSR signal using the CRS-316 TMI, or for HSSI with CA/TA signals using the CRS-336 TMI. Refer to* Chapter 4. MODEM, TMI, AND SWITCH CONFIGURATION *for this important configuration information.***
3. ***When used with the CRS-300, the SLM-5650/5650A is NOT compatible for use in a Vipersat network.***
4. ***Modems using a single port (i.e., Port 1) of the 4-Port Network Processor Module can NOT be mixed with modems using EIA-530 or HSSI data interfaces, or the G.703 or single port Gigabit Ethernet module options.***

4.10.2 Control Cable Connections – CRS-300 to Modems

The Control Cable CA/WR12136-1 provides the serial communication path between the Switch and the modems and controls the modem's external Tx IF-mute control line, and is therefore always required.

To provide User access to the AGC and I&Q outputs of the modem, Control Y-Cable CA/WR12842-6, sold separately, is available for use in place of the CA/WR12136-1 cable. See **Appendix A. CABLE DRAWINGS** for detailed information about these optional cable assemblies.

Refer to **Figure 4-32** through **Figure 4-34** to connect and secure the CA/WR12136-1 cable (or the Control Y-Cable CA/WR12482-6, if used) between the CRS-300 and each SLM-5650/5650A as follows:

- HD-15F connector labeled "J1" on the RMI or TMI(s), to
- HD-15F connector labeled "J9 Auxiliary" on the SLM-5650/5650A.

4.10.3 Traffic Data Connections – CRS-300 to Modems

Referring to Figure 4-32:

If HSSI is the traffic data type, connect and secure the HSSI Data Cable CA/WR9189-6 between the CRS-300 and each SLM-5650/5650A as follows:

- HSSI (HD-50F) connector labeled “J2” on the RMI or “J3” on the TMI(s), to
- HSSI (HD-50F) connector labeled “J7 HSSI” on the SLM-5650/5650A.

If EIA-530/-232 is the traffic data type, connect and secure the Control/Data Cable CA/WR0066 (used for data purposes) between the CRS-300 and each SLM-5650/5650A as follows:

- DB-25M connector labeled “P2” on the RMI, or “P1” on the TMI(s), to
- DB-25F connector labeled “J6 EIA530” on the SLM-5650/5650A.

Referring to Figure 4-33:

If Balanced G.703 is the traffic data type, connect and secure the CA/WR9038-1 cable between the CRS-300 and each SLM-5650/5650A as follows:

- DB-15M connector labeled “P1” on the RMI or TMI(s), to
- DB-15F connector labeled “J1 Bal Data” on the SLM-5650/5650A.

If Unbalanced G.703 is the traffic data type, connect and secure the pair of BNC PL/0813-8 cables between the CRS-300 and each SLM-5650/5650A as follows:

- BNC connectors labeled “J4 Tx” on the RMI, or “J3 Tx” on the TMI(s), to BNC connectors labeled “J3 Rx” on the SLM-5650/5650A, and
- BNC connectors labeled “J3 Rx” on the RMI, or “J5 Rx” on the TMI(s), to BNC connectors labeled “J2 Tx” on the SLM-5650/5650A.

4.10.3.1 Ethernet Traffic Data Connections

Due to limitations of its backplane, the CRS-300 can support **Single-port Ethernet Bridge Mode** only.

4.10.3.1.1 Ethernet Bridge Mode via the Optional GbE Interface

When the SLM-5650/5650A modems are equipped with the optional single-port 10/100/1000 Base-T (GbE) Interface card, only **Single-port Ethernet Bridge Mode** is possible. As shown in **Figure 4-32**, connect and secure all Cat5 Data Cables PP/CAT5FF3FTGY as follows:

- RJ-45 connector labeled “J5” on the RMI or TMI, to
- RJ-45 connector labeled “J1” on the optional GbE Interface card.

4.10.3.1.2 Ethernet Bridge Mode via the Optional NP Interface

When the SLM-5650/5650A modems are equipped with the optional multi-port Network Processor (NP) Interface card, only **Single-port Ethernet Bridge Mode** is possible. As shown in **Figure 4-34**, connect and secure all Cat5 Data Cables PP/CAT5FF3FTGY as follows:

- RJ-45 connector labeled “Port 1” on the RMI or TMI, to
- RJ-45 connector labeled “Port 1” on the optional Network Processor (NP) Interface card.

IMPORTANT

Do not connect to Port 2 through Port 4 on the RMI, TMI, or optional Network Processor (NP) Interface when operating in Single-port Ethernet Bridge Mode.

4.10.4 User Data Connections – CRS-300 to User

The User's traffic data from an external router, multiplexing equipment or test data generator should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.

Refer to **Chapter 1.4.4 Modem Interface Cards** for detailed information on the RMI and TMI cards available for use with the SLM-5650/5650A modems.

4.10.5 ESC Data Connections – CRS-350 to Modems

Refer to **Figure 4-35** to connect and secure the Control/Data Cable CA/WR0066 between the rear panel of the CRS-350 and each SLM-5650/5650A as follows:

- DB-25F J*xx* "Overhead" connector on the CRS-350 rear panel (where *xx* specifies the numbers 1 through 10 Traffic SLM-5650/5650As, and "R11" is reserved for the Redundant SLM-5650/5650A), to
- DB-25M "P1 Overhead Data" connector on each SLM-5650/5650A.

4.10.6 User ESC Data Connections – CRS-350 to User

The User's equipment should be connected to the correct corresponding plug-in User Data Interface (UDI) card on the front panel of the CRS-350. This replaces the direct connection to the Traffic SLM-5650/5650A's "Overhead" port.

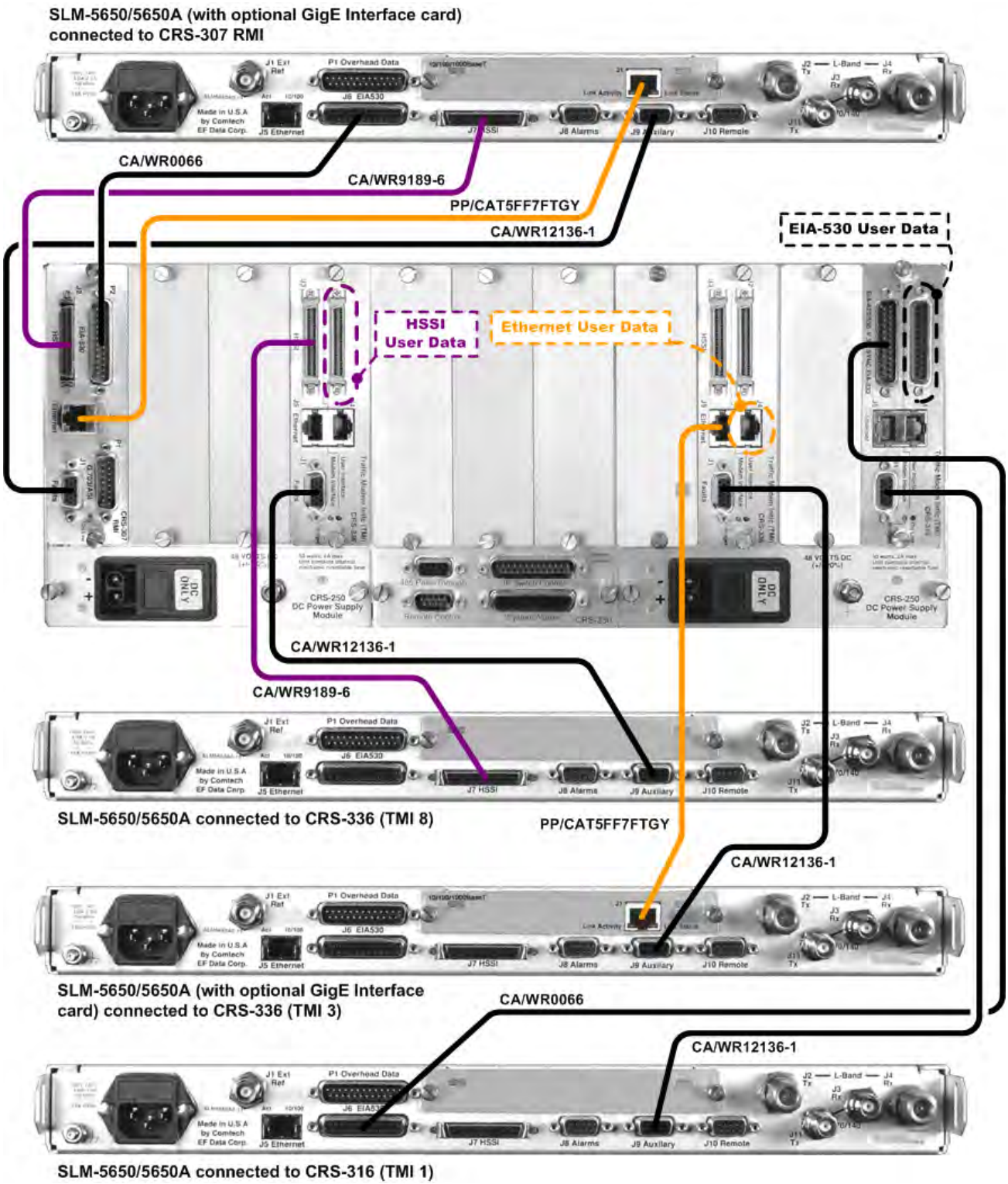


Figure 4-32. Control and Data Cables Example #1 – CRS-300 to SLM-5650/5650A
(Connections shown for RMI & TMIs 1, 3, and 8 only)

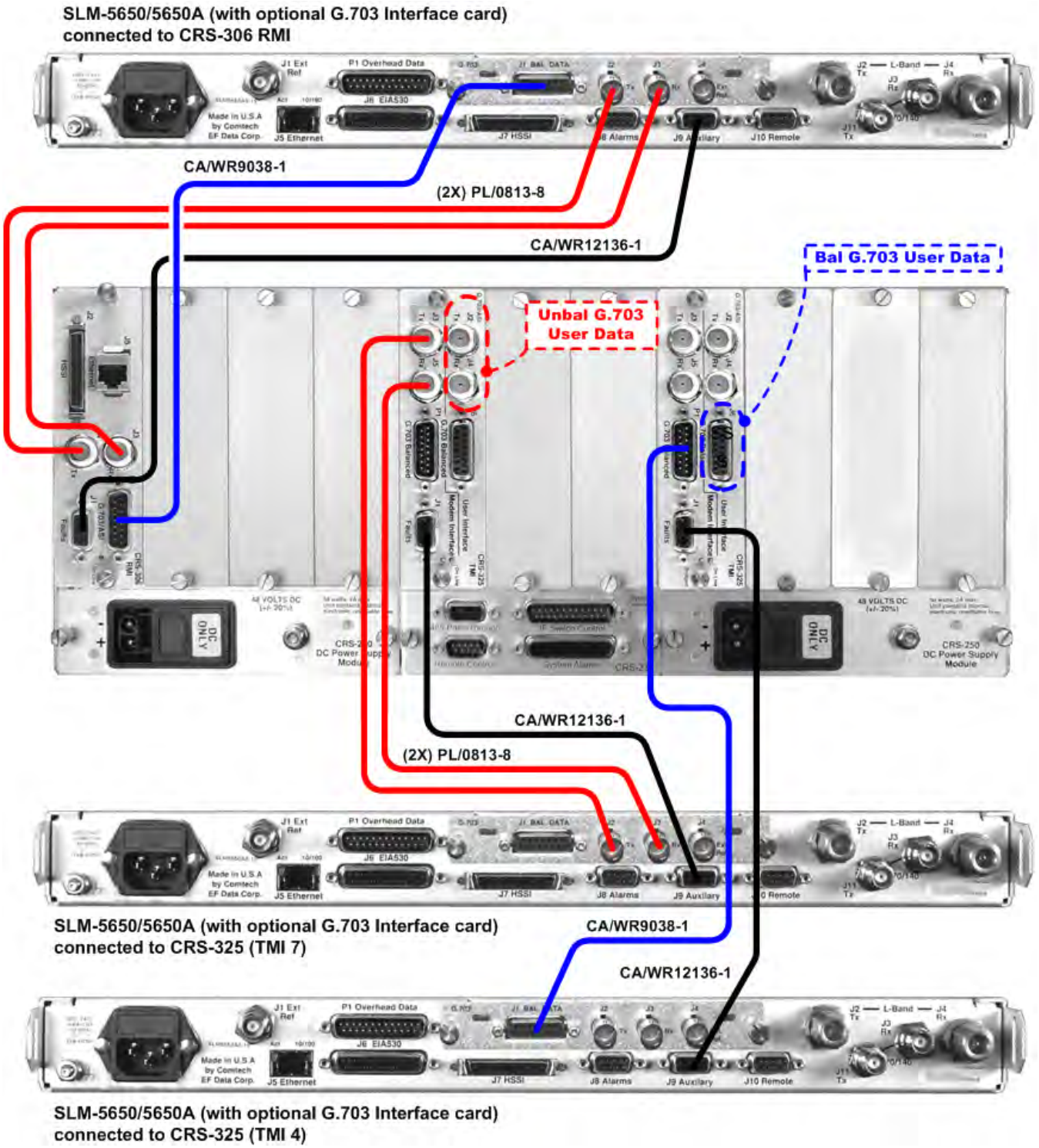


Figure 4-33. Control and Data Cables Example #2 – CRS-300 to SLM-5650/5650A
(Connections shown for RMI & TMIs 4 and 7 only)

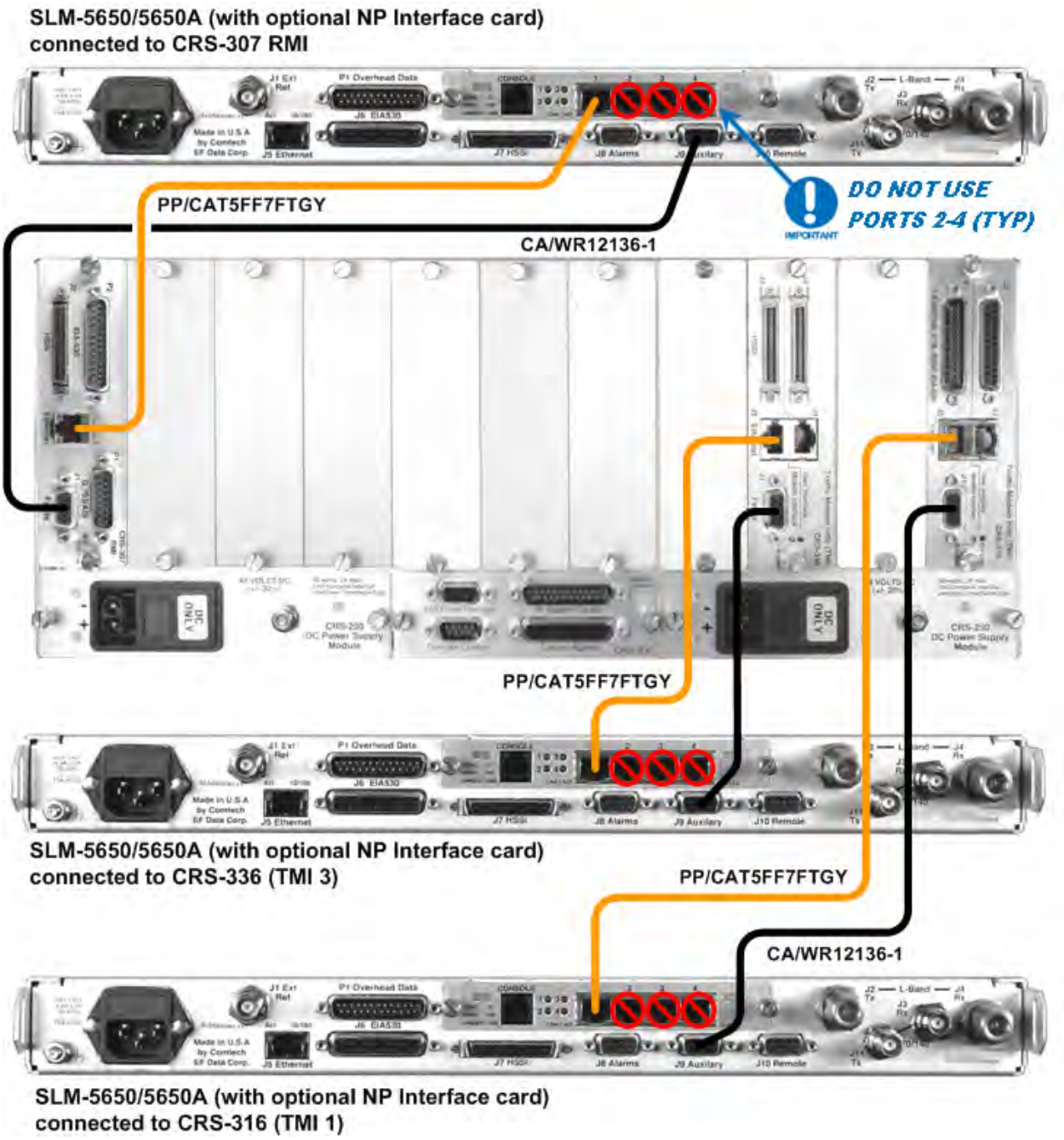


Figure 4-34. Control and Data Cables Example #3 – CRS-300 to SLM-5650/5650A
(Connections shown for RMI & TMIs 1 and 3 only)

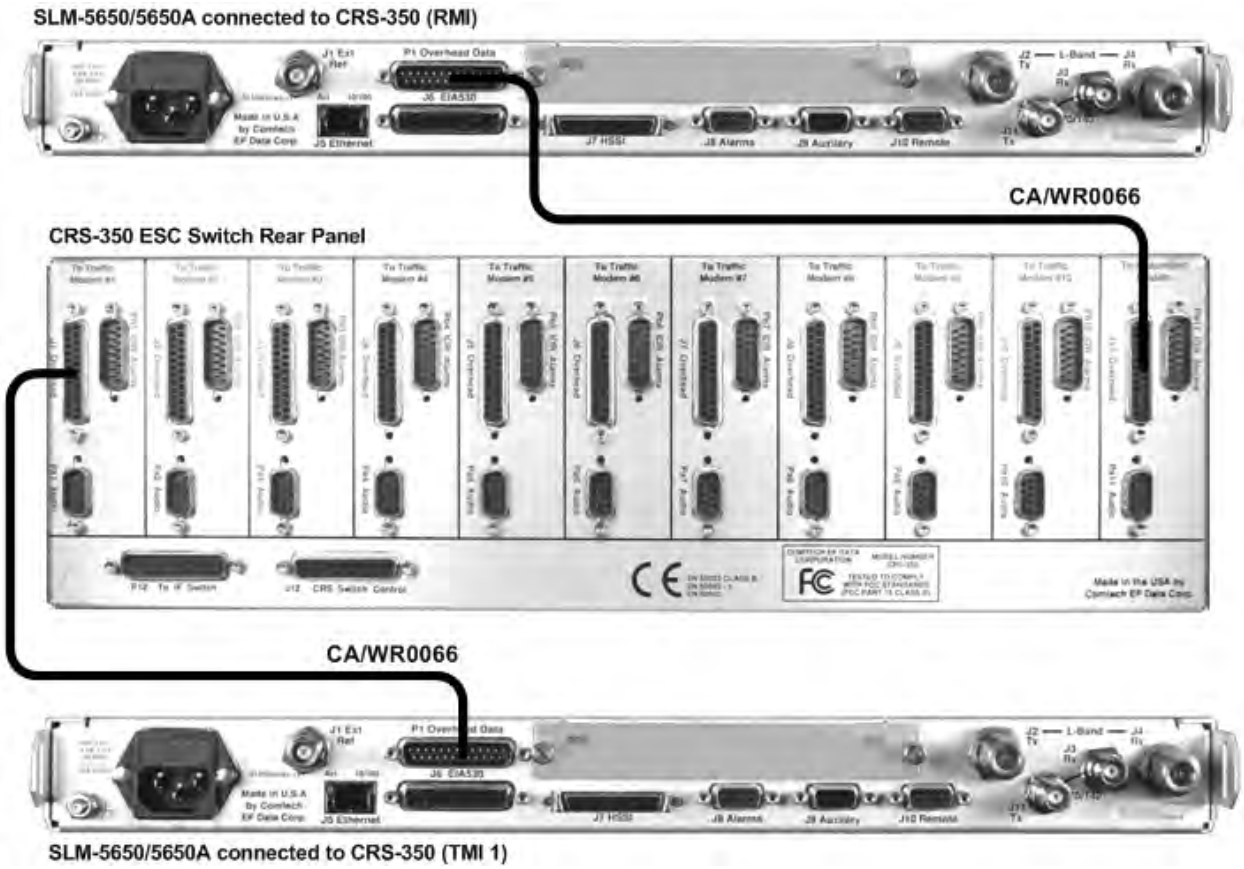


Figure 4-35. Cabling Example for CRS-350 to SLM-5650/5650A
(Connections shown for RMI and TMI 1 only)

4.11 IF Cable Connections

- **Single Transponder IF Connections**
- **Multiple Transponder IF Connections (Using IF Switch)**

4.11 IF Cable Connections

There are two different possible IF configurations: single transponder and multiple transponders.

1. For a single transponder, all the modems are connected to the same user Up/Downconverter.
2. For multiple transponders, the modems may be grouped and connected in various combinations to multiple up/down converters. The CRS-280 (70/140 MHz) IF Switch is required for multiple transponder operation.

   If using the CRS-280L (L-Band) IF Switch, additional installation information can be found in the ***CRS-280L Installation and Operation Manual***.

Proceed with the transponder configuration method applicable to your system.

4.11.1 IF Cable Connections – Single Transponder (without CRS-280/280L)

IMPORTANT

To prevent problems resulting from impedance mismatch, ensure that the impedance for the modem's cables and combiner are the same.

Referring to Figure 4-36 (L-Band operation shown):

For single transponder IF configurations, connect the user-provided IF cables as follows:

► For Transmit (Tx) IF Connections:

- Connect the appropriate user-provided IF cables from each modem's "Tx IF" connector (BNC for 70/140 MHz, Type 'N' for L-Band) to a single user-provided power combiner.
- Connect the output of the power combiner to the user Upconverter.

► For Receive (Rx) IF Connections:

- Connect the appropriate user-provided cables from each modem's "Rx IF" connector (BNC for 70/140 MHz, Type 'N' for L-Band) to the output ports of a single user-provided splitter.
- Connect the input of the splitter to the output of the user Downconverter.

When a modem is taken offline, its Tx IF is automatically muted (shut down) by the CRS-300.

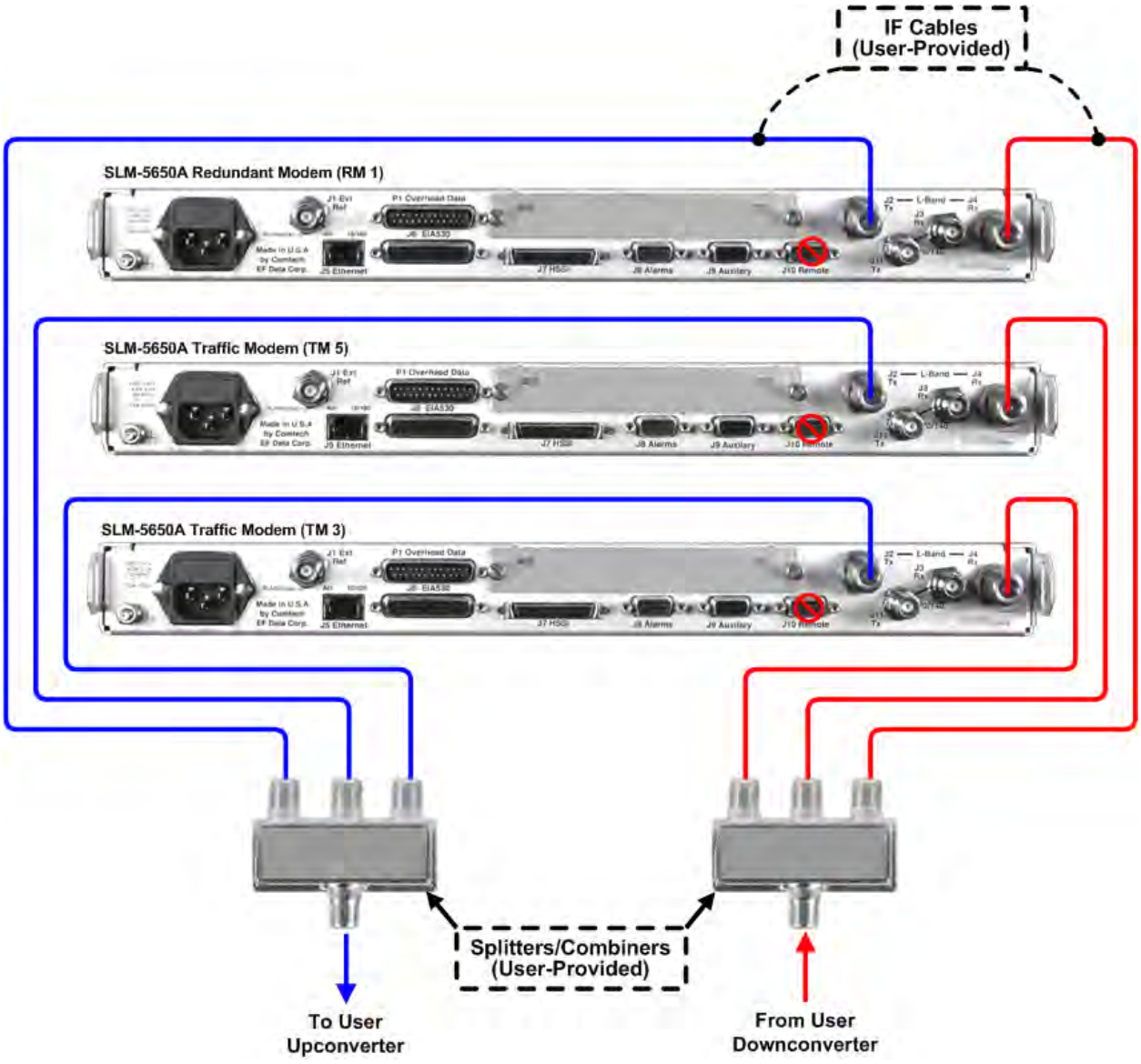


Figure 4-36. IF Cabling Example 1 – Single Transponder Configuration
(Without CRS-280/280L – Connections shown for 1:N <1> RM with TMs 3 and 8 only)

4.11.2 Multiple Transponder IF Connections (Using IF Switch)

The CRS-280 IF (70/140 MHz) Switch provides complete isolation of the IF signals. The Redundant Modem's IF signals are routed to the Traffic Modem's IF path when the RMI is online. The CRS-300 automatically senses the presence of the CRS-280. The CRS-300, upon switching, leaves the offline modem with its IF on, and the CRS-280's relays isolate any undesired signals.

Figure 4-37 provides a generic example of multiple transponder IF connections – in this instance, a 1:1 configuration using a CRS-280 IF Switch with CDM-600 modems. Using **PL/0946-2 (50Ω)** or **PL/0813-8 (75Ω)** BNC to BNC IF cables, observe the following for all modem/switch configurations:

From the Redundant Modem:

- Connect the "Rx IF" BNC connector on the Redundant Modem to the BNC connector on the CRS-280 switch labeled '**TO REDUNDANT MODEM Rx**'.
- Connect the "Tx IF" BNC connector on the redundant modem to the BNC connector on the CRS-280 switch labeled '**Tx FROM REDUNDANT MODEM**'.

From the Tx Traffic Modems:

- Connect the "Rx IF" BNC connector on each Traffic Modem to a BNC connector on the CRS-280 switch labeled '**Rx #** ***(where Rx # designates Rx 1 through Rx 10)*** **TO TRAFFIC MODEM**'.
- Connect the "Tx IF" BNC connector on each Traffic Modem to a BNC connector on the CRS-280 switch labeled '**Tx #** ***(where Tx #designateis Tx 1 through Tx 10)*** **FROM TRAFFIC MODEM**'.

Note: If using the CDM-Qx modem with the CRS-280 IF (70/140 MHz) Switch, or the CDM-QxL modem with the CRS-280L (L-Band) Switch, use no more than one Mod / Demod per CDM-Qx/QxL chassis.

Additionally, when using the CRS-280L (L-Band) IF Switch, detailed installation information is provided in the ***CRS-280L 1:N Redundancy Switch Installation and Operation Manual***.

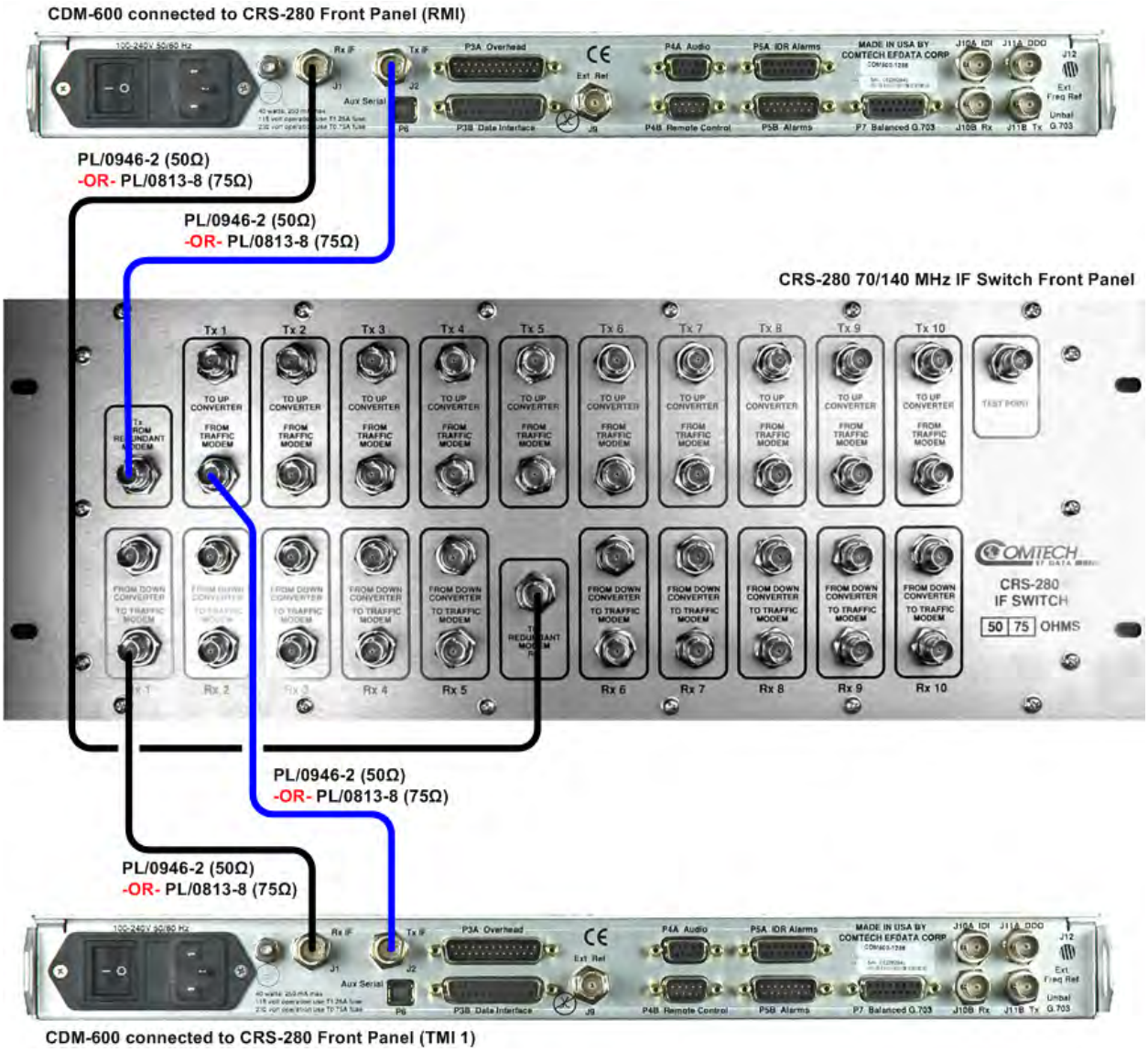


Figure 4-37. Multiple Transponder IF Connection Cabling Example
(CRS-280 and CDM-600s shown, connections for RMI and TMI 1 only)

Notes:

Chapter 5. MODEM, RMI/TMI, AND SWITCH CONFIGURATION

5.1 Overview

In order to avoid damage to the modems and CRS-300 switch, it is important for the user to follow this sequence of configuration:

- First, ***connect cables between the (powered OFF) modems and Switch as outlined in*** **Chapter 4. CABLES AND CONNECTIONS*.***
- Second, ***configure the modems for 1:N redundant operation as outlined in this chapter in*** **Sect. 5.2 Modem Configuration*.***
- Third, ***if needed, configure the Switch RMI/TMI cards as outlined in this chapter in*** **Sect. 5.3 RMI Card Configuration Reference** ***and*** **Sect. 5.4 TMI Card Configuration Reference*.***
- Fourth, ***once the modems and Switch RMI/TMI cards have been properly configured for 1:N redundant operation, the User should then set the CRS-300 for proper operation via the front panel, as outlined in this chapter in*** **Sect. 5.5. Switch Configuration.**

5.2 Modem Configuration

5.2.1 Modem Power

Connect the power cords of each modem to a power supply and turn all modems **ON**.

5.2.2 Modem Firmware and Hardware Requirements

For the CRS-300 1:10 Redundancy Switch to operate correctly, it is important that all Traffic Modems and the Redundant Modem must be of the same model. In addition to matching hardware requirements, the Redundant Modem must have the same software revision and installed options so that the it can properly mimic all Traffic Modems.

Permitted modem models and firmware versions are as follows:

Modem	Modem Firmware Version	GigE Firmware Version
CDM-570	1.4.1 or later	N/A
CDM-570L	1.3.1 or later	N/A
CDM-Qx/QxL	1.1.4 or later	N/A
CDM-600	1.1.5 or later	N/A
CDM-600L	1.1.1 or later	N/A
CDM-700	1.2.1, 1.2.4 or later (Note: When using GigE, F/W Ver. 1.2.3 is not compatible with the CRS-300)	1.1.9
CDM-710	4.1.1 or later	1.1.3
CDM-710G	5.1.1. or later	1.1.9
CDM-625	1.1.1 or later	N/A

SLM5650/5650A Firmware and Hardware Requirements: In order to support the desired redundancy, the appropriate firmware must be loaded in the SLM-5650/5650A base modem, Network Processor (if applicable) and CRS-300. Higher versions of the firmware continue support for the given interface (i.e. the highest version supports all interfaces); the lowest firmware versions required to support a given interface type are shown in the following table:

Interface Type	SLM-5650 Base Modem	SLM-5650A Base Modem	10/100/1000 Base-T (GbE) Interface card	Network Processor Module	CRS-300
Serial (EIA-232/HSSI)	1.2.4	1.1.1	N/A	N/A	2.1.7
Ethernet (Single-port Ethernet Bridge Mode using 10/100/1000 Base-T card)	1.2.4	1.1.3	1.1.2	N/A	2.1.7
Ethernet (Single-port Ethernet Bridge Mode using Port 1 of 4-port NP Module)	1.5.1	1.1.8	N/A	1.5.1	2.1.7

5.2.2.1 Flash Updating

For detailed instructions on upgrading modem firmware via Flash Update, refer to the pertinent modem's *Installation and Operation Manual.*

5.2.3 Modem Operational Configuration

This chapter assumes user familiarity with the menu navigation and configuration parameter selection methods using the individual modems' front panel menu. For detailed instructions on

changing configuration settings using the front panel keypad and menus, refer to the *Front Panel Operation* chapter in the pertinent modem's *Installation and Operation Manual*.

Using the modem's manual, configure each Traffic Modem for the proper Rx and Tx IF, power settings, modulation, code rates, and traffic data settings.

For User-to-Switch or User-to-Modem addressing schemes, see **Appendix B. ADDRESSING SCHEME INFORMATION.**

If the modem does not meet these listed requirements, contact Comtech EF Data. Flash firmware upgrades are free and may be downloaded from the CEFD Web page. Hardware revision upgrades must be performed at CEFD.

5.2.4 Modem Redundancy Configuration

5.2.4.1 Switch to CDM-570/570L, CDM-600/600L Redundancy Configuration

The CRS-300 communicates to the Redundant and Traffic modems via a serial EIA-232 bus contained within each of the DB-25 control/data cable.

Configure the COMMS of each of the modems via the ***modem*** front panel menu (note that EIA-232 is referred to on the menus as RS-232):

CONFIG → REMOTE: RS-232, 9600 baud, format 8-N-1.

5.2.4.2 Switch to CDM-625 Redundancy Configuration

The CRS-300 communicates to the Redundant and Traffic modems via a serial COMM bus contained within each of the DB-25 or HD-15 control/data cables.

Configure the COMMS of each of the modems via the ***modem*** front panel menu:

SELECT: Configuration → Remote → Remote Control = Remote → RS-232 → *Set baud rate to* ***9600***

To configure the CDM-625 for 1:N redundancy:

Step	Procedure
1	The DB-25 "Data" connector on the modem back panel must be configured for "Redundancy Mode". On each modem, set "1:N" redundancy to the **Active** state: **SELECT: Utility → 1:N → Enable,Disable** set to **Enable.** Press **ENTER** to save settings
2	**Power down** all CDM-625s.
3	**Power up** all CDM-625s. Verify that each Traffic Modem is **ONLINE** via the front panel LEDs.

5.2.4.2.1 CDM-625 Redundancy Configuration with Carrier-in-Carrier®

If Carrier-in-Carrier® (CnC) is utilized with any CDM-625 traffic modem, special configuration steps must be taken to ensure proper operation of the modem(s) within a configured 1:N Redundancy System.

Before any configurations can be made, refer to **Figure 4-9** and the instructions found on Page 4-22 in **Chapter 4. CABLES AND CONNECTIONS** to connect and secure the PMSI Multi-drop CnC Plus Cable CA-0000275 (<11X> DB-9M, 8.25') between the Redundant Modem and any Traffic Modem(s) ***using CnC***.

The CA-0000275 cable bypasses the CRS-300 1:10 Redundancy Switch.

Once all ***CnC-enabled*** modems have been interconnected with the PMSI Multi-drop Cable, the user must then configure **each *CnC-enabled*** modem via the *modem's* front control panel:

From the CDM-625 top-level **SELECT:** menu, using the ◄► arrows and **ENTER** keys, navigate each menu level until the PMSI control mode display screen appears:

SELECT: Configuration → CnC → PMSI-control

```
Select: Configuration Test Monitor
Info Store/Ld Utility ODU FAST (◄ ►)
```

```
CONFIG: All Mode Tx Rx Clocks D&I
CnC EDMAC Misc Mask Remote IP (◄ ►)
```

```
Carrier-in-Carrier: Mode   Freq-Offset
Search-Delay  PMSI-control     (◄ ►)
```

```
CnC PMSI mode: Redundancy
  (Idle, Redundancy, Talk, Listen) (▲▼)
```

From the **PMSI mode** display screen, use the ▲ ▼ arrow keys to select **Redundancy**, then press **ENTER.**

The **Pre-Mapped Symbol Interface (PMSI)** is a function associated with DoubleTalk® Carrier-in-Carrier® that permits the modulator in a selected unit to provide a direct copy of its output (the outbound interferer) to one or many other modems. The other modem(s) may then choose to take the PMSI signal, and use it for its own CnC reference. The PMSI is an EIA-485 multidrop bus system where one device transmits, and all other devices on the multi-drop bus are configured to receive.

This configuration step must be repeated for every* CnC-enabled *CDM-625 within the configured redundancy system.

5.2.4.3 Switch to CDM-700, CDM-710, CDM-710G Redundancy Configuration

IMPORTANT

Only the Rev. A ***chassis (i.e., chassis with round-buttoned keypad) and*** later ***versions of the CDM-700/710 offer 1:N redundancy operation.***

The CRS-300 communicates to the Redundant and Traffic modems via a serial TTL bus contained within the CDM-700/710/710G DB-15 "Alarms" connector on the modem back panel. A DB-15 to HD-15 Control Cable connects each modem to the CRS-300.

To configure the CDM-700/710/710G and CRS-300 for 1:N redundancy:

Step	Procedure
1	If the terrestrial data type is Ethernet, for each modem, enter a unique IP Address for the CDI-70 (GigE Interface) that is on the same subnet: **For the CDM-700: CONFIG → Intfc1 → MAN → ADDRESS** **For the CDM-710 or CDM-710G: CONFIG → Intfc2 → MAN → ADDRESS**
2	The DB-15 "Alarms" connector on the modem back panel must be configured for "Redundancy Mode". On each modem, set the redundancy to the **Active** state: **CONFIG → AUX (Redundancy Mode) → ENA/DIS** set to **Enable.** Press **ENT** to save parameters to flash memory. The CDM-700/710/710G modems do not have any further COMM menus configured by the User.
3	**Power down** all CDM-700s/710s/710Gs.
4	**Power up** all CDM-700s/710s/710Gs. Verify that each Traffic Modem is **ONLINE** via the front panel LEDs.

IMPORTANT

All configuration changes can only be made to the Online CDM-700/710/710G and will require the User to "Save Parameters to permanent storage" to ensure the configuration change is also applied to the Backup CDM-700/710/710G.

Refer to the *CDM-700, CDM-710, or CDM-710G Installation and Operation Manuals* for detailed configuration information.

5.2.4.4 Switch to SLM-5650/5650A Redundancy Configuration

5.2.4.4.1 TTL (Switch) Configuration (For All Traffic Data Types)

The CRS-300 communicates to the Redundant and Traffic modems via a serial TTL bus contained within the HD-15 "J9 Auxiliary" connector on the modem's rear panel. An HD-15M to HD-15F Control Cable connects each modem to the CRS-300.

To use 1:N redundancy, the SLM-5650/5650A must have communications configured to TTL (Switch) in order to communicate with the CRS-300. To set the serial interface:

Step	Procedure
1	From the SLM-5650/5650A front panel menu, navigate to **Config: Remote → SerialConfig**.
2	Set **Interface** to **TTL (SWITCH)**.
3	Set **Format** to **8N1**.
4	Set **Baudrate** to **9600** Baud**.**
5	Verify that Traffic Modem is **ONLINE** and the Redundant Modem is **OFFLINE**.

For detailed information on using the front panel menus, see **Chapter 5. FRONT PANEL OPERATION** in the *SLM-5650* or *SLM-5650A Installation and Operation Manual*.

5.2.4.4.2 Ethernet Bridge Mode Configuration via Optional Network Processor (NP) Interface

Due to backplane limitations, the CRS-300 can support **Single-port Ethernet Bridge Mode** only. Ethernet Bridge Mode redundancy, when using SLM-5650/5650A modems equipped with the optional Network Processor (NP) Interface, is provided by a single IP address scheme.

To verify Single IP Address Mode on the **Online** Modem:

Step	Procedure
1	From the SLM-5650A front panel, navigate to **Config: Remote → EthernetConfig → Option Card Addr →Network Proc**.
2	Verify that the **Mode** appears as **Single**.

To verify Single IP Address Mode on the **Offline** Modem:

Step	Procedure
1	From the SLM-5650A front panel, navigate to **Config: Remote → EthernetConfig → Option Card Addr →Network Proc**.
2	Set the **Traffic IP** Address of the **Online** Modem *only*.
3	Verify that the **Traffic IP** Address also appears on the **Offline** Modem.

In Ethernet Bridge Mode, the CRS-300 will keep the Online Modem's active Ethernet Port turned **on**, while the Offline Modem's active Ethernet Port is turned **off**. The traffic IP address is only accessible on the Online Modem.

Furthermore, in Ethernet Bridge Mode, the parameter backup mechanism is unsupported; therefore, the User must make sure that all parameters match in the Online and Offline modems.

Refer to the *SLM-5650* or *SLM-5650A Installation and Operation Manual* for detailed configuration information.

5.2.4.4.3 Ethernet Bridge Mode Configuration via Optional GbE Interface

Due to backplane limitations, the CRS-300 can support **Single-port Ethernet Bridge Mode** only. Ethernet Bridge Mode redundancy, when using SLM-5650/5650 modems equipped with the optional 10/100/1000 Base-T (GbE) Interface, is provided by a Single IP Address scheme.

To configure the SLM-5650/5650A for Ethernet Bridge Mode 1:1 redundancy, for each modem enter a unique IP Address for the optional 10/100/1000 Base-T (GbE) Interface card that is on the same subnet:

CONFIG → MODE → INTERFACE → GIGABIT ETHERNET

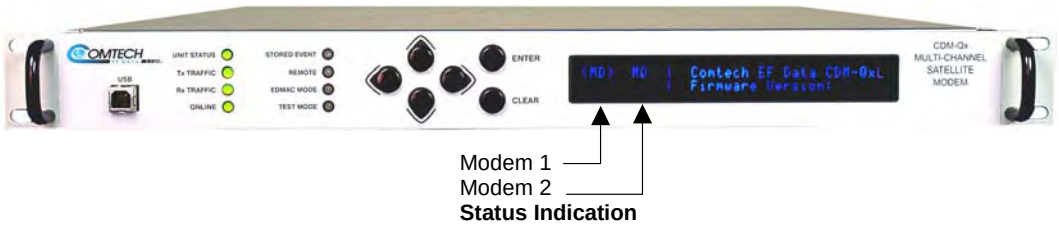
Refer to the *SLM-5650* or *SLM-5650A Installation and Operation Manual* for detailed configuration information.

5.2.4.5 Switch to CDM-Qx/QxL Redundancy Configuration

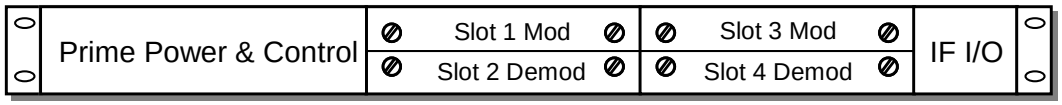
The CRS-300-to-CDM-Qx/QxL redundancy configuration uses an external EIA-485 multi-drop communication cable.

The CDM-Qx/QxL can be configured many different ways, such as one to four modulators, or one to four demodulators, or a mix and one or modems. For a CRS-300 application, the CDM-Qx/QxL should be configured only as one modem: containing one modulator and one demodulator card, which must be ***grouped*** to act as a modem. See the CDM-Qx/QxL Installation and Operation Manual for more information.

As shown in **Figure 5-1**, Modem 1 resides in Slots 1 and 2. Modem 2 is contained in Slots 3 and 4. The Switch can use either modem.



(a) Front Panel



(b) Rear Panel Schematic

Figure 5-1. CDM-Qx/QxL Serial Communication Configuration

The CDM-Qx/QxL chassis has a configurable EIA-485 (referred to on the menus as RS-485) base address – which applies for Modem 1 – and an offset, which is added to the base-address if addressing Modem 2. The RS-485 addresses are selected via the front panel menu: **CONFIG → REMOTE**.

The Switch addresses each CDM-Qx/QxL modem based on which TMI it is attached to, with addresses at increments of 100. For a Switch with address 0, a Qx on TMI 1 has address 0100, on TMI 2 address 0200, etc to address 1000 for TMI 10. The RMI uses address 1100. See **Figure 5-2** and **Appendix B. ADDRESSING SCHEME INFORMATION** for more information.

Once the addressing scheme is understood, proceed as follows:

Step	Procedure
1	Configure COMs on each modem via the modem front panel menu as follows: **CONFIG → REMOTE: RS-485-4W, 9600 baud, format 8-N-1**.
2	Set the RS-485 (EIA-485) base address and offset, per **Appendix B. Addressing Scheme Information**.

Refer to the *CDM-Qx Installation and Operation Manual* for detailed configuration information.

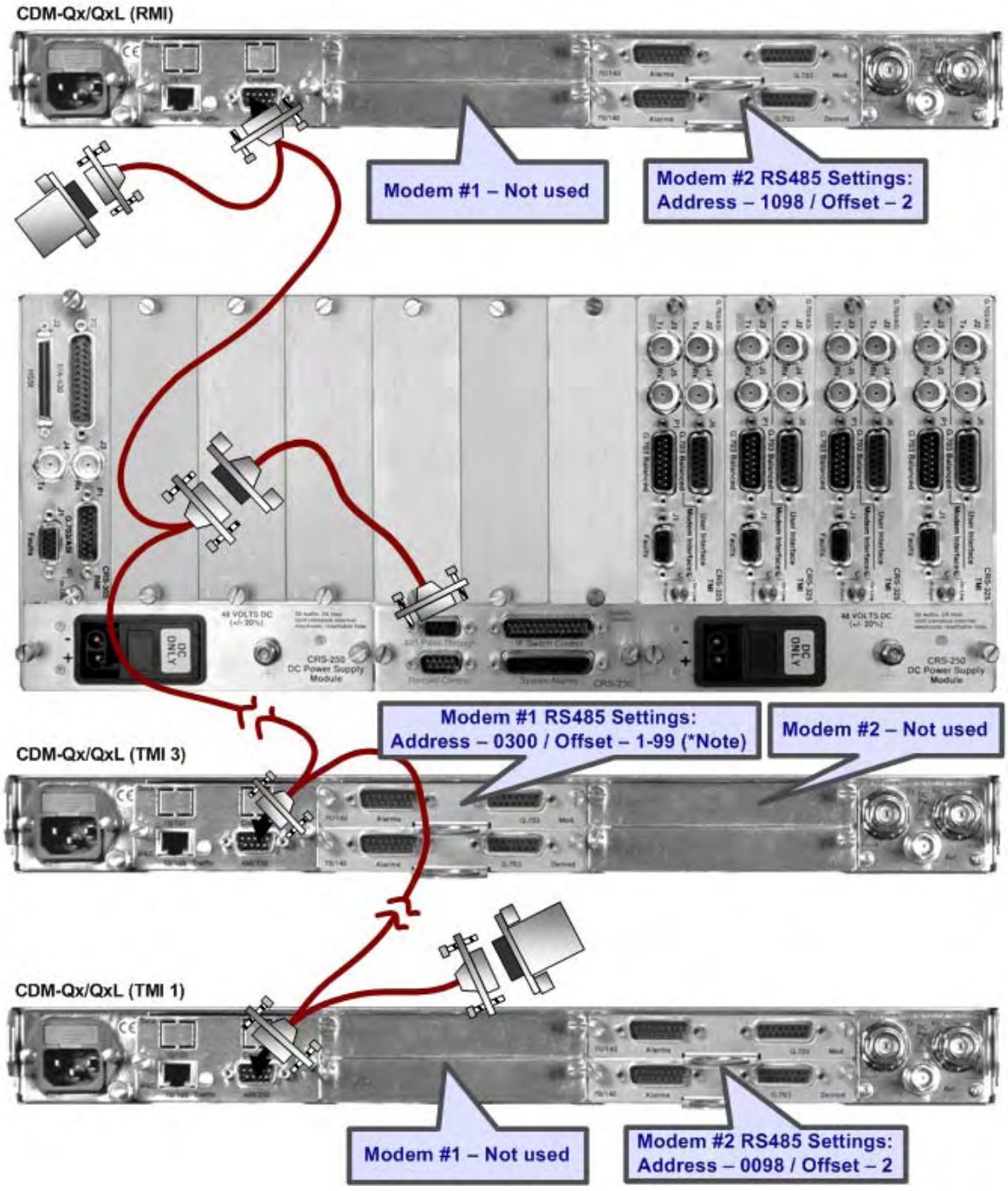

CDM-Qx/QxL (RMI)
Modem #1 – Not used
Modem #2 RS485 Settings:
Address – 1098 / Offset – 2
Modem #1 RS485 Settings:
Address – 0300 / Offset – 1-99 (*Note)
Modem #2 – Not used
CDM-Qx/QxL (TMI 3)
CDM-Qx/QxL (TMI 1)
Modem #1 – Not used
Modem #2 RS485 Settings:
Address – 0098 / Offset – 2

Figure 5-2. CDM-Qx/QxL / CRS-300 EIA-485 Scheme

Note: In this example, the EIA-485 offset address does not affect Modem #1, so the offset can be 1-99 without affecting other Modems' EIA-485 addresses.

5.3 RMI Card Configuration Reference

IMPORTANT

The RMI Card Configuration Reference is provided for RMI identification purposes only. All RMI cards are shipped pre-configured and do not require adjustments by the user.

The CRS-305, CRS-306, and CRS-307 RMI cards come pre-configured for proper operation. All three cards share a common printed circuit board (CEFD P/N PC/11494x); what distinguishes the cards from one another is the configuration of front panel connectors, and configuration of the JMP1 jumper setting on the PCB.

Figure 5-3 shows the PCB used for all three RMIs, with the typical JMP1 jumper location identified.

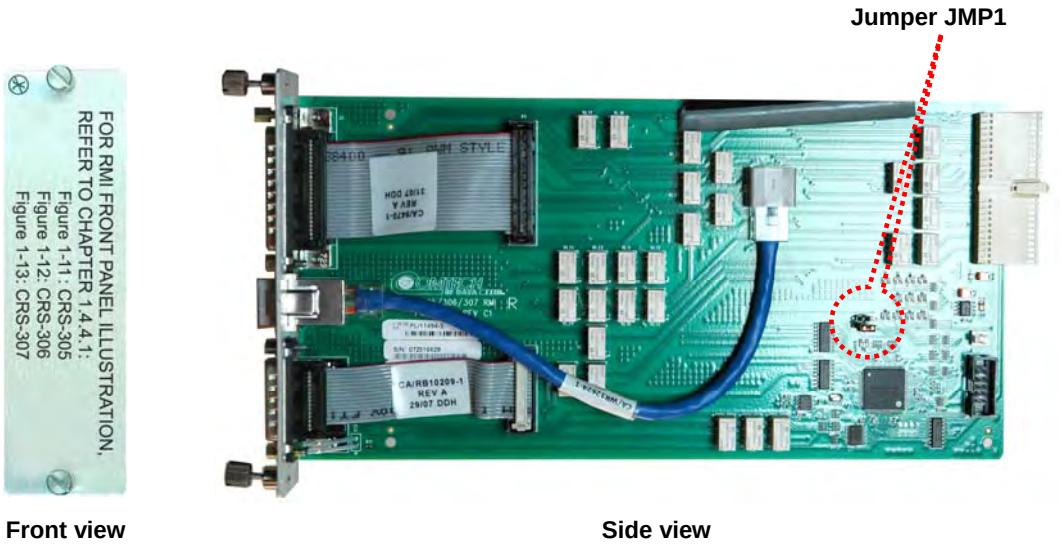
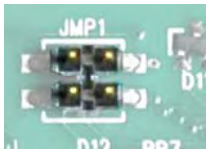
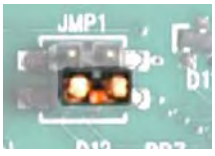


Figure 5-3. CEFD P/N PC/11494x RMI PCB (CRS-307 shown)

Table 5-1 illustrates the JMP1 jumper settings, as established at the factory for each RMI card.

Table 5-1. RMI JMP1 Factory-configured Jumper Settings

'JMP1' Jumper Setting – AS SHIPPED		
CRS-305 *(No jumpers)*	**CRS-306** *(Pins 1 to 2 jumped)*	**CRS-307** *(Pins 3 to 4 jumped)*
		

5.4 TMI Card Configuration Reference

The following paragraph describes settings for any of the individual TMI cards that may require jumper or other installation settings on the card.

5.4.1 EIA-530 Interfaces via the CRS-316 TMI

Figure 5-4 and **Figure 5-5** depict the CRS-316 TMI (CEFD P/N PL/12498 Rev A or later) as shipped from the factory, with jumpers JP1 through JP6 open. For modem-specific operations, observe the following:

- For CDM-625 modems, the following jumpers settings are permitted for JP1 and JP2 only:
  - For 'RTS to CTS' Loop: Pin 1 to Pin 3 (JP1 and JP2).
  - For 'RTS' to control TX IF mute operation for online modem: Pin 3 to Pin 5 (JP2).
- For SLM-5650A modems, jumpers settings for jumpers JP1 thru JP6 are as follows: Pin 1 to Pin 2; Pin 3 to Pin 4.

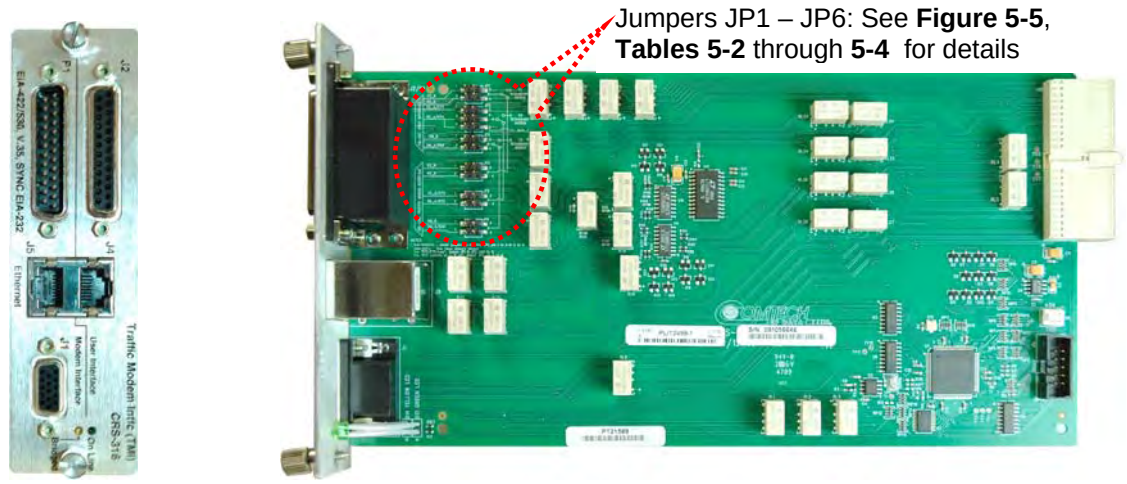


Figure 5-4. CRS-316 EIA-530 TMI Card

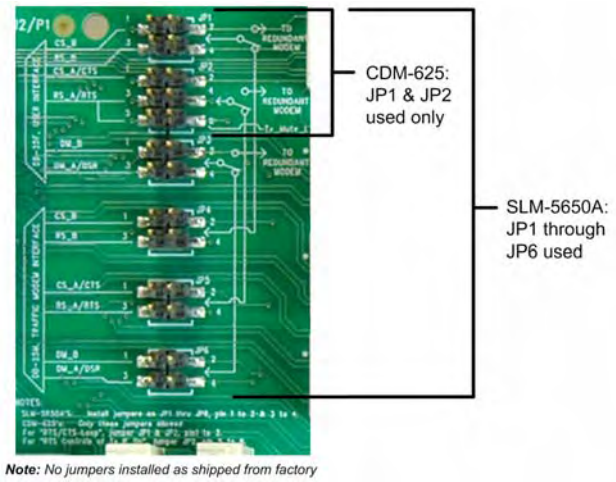


Figure 5-5. CRS-316 Jumpers JP1 through JP6 Detail (as shipped)

Table 5-2. CRS-316 Jumper 'JP1' Settings

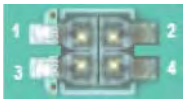
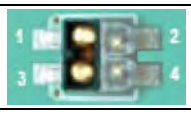
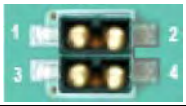
User Interface Jumper 'JP1'			
Modem	**Control Signal Setting**	**Jumper Settings**	
		Detail	**Pin Settings**
CDM-625	**CS_B & RS_B Signals** ***Not Connected***		**N/A** ***(Note: TMI as shipped)***
CDM-625	**CS_B to RS_B** ***Loop Connected*** ***at User DB-25 Connector***		**Pin 1 to Pin 3**
SLM-5650A	**CS_B & RS_B** ***Routed to online modem***		**Pin 1 to Pin 2;** **Pin 3 to Pin 4**

Table 5-3. CRS-316 Jumper 'JP2' Settings

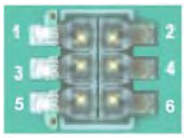
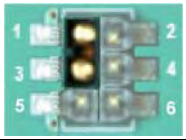
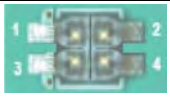
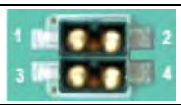
User Interface Jumper 'JP2'			
Modem	**Control Signal Setting**	**Jumper Settings**	
		Detail	**Pin Settings**
CDM-625	**CS_A/CTS & RS_A/RTS** ***Not Connected***		**N/A** ***(Note: TMI as shipped)***
CDM-625	**CS_A/CTS & RS_A/RTS** ***Loop Connected*** ***at User DB-25 Connector***		**Pin 1 to Pin 3**
CDM-625	**RTS** ***Controls online modem's Tx*** ***IF mute operation***		**Pin 3 to Pin 5**
SLM-5650A	**CS_A/CTS & RS_A/RTS** ***Routed to online modem***		**Pin 1 to Pin 2;** **Pin 3 to Pin 4**

Table 5-4. CRS-316 Jumper 'JP3' through – 'JP6' Settings

User Interface Jumpers 'JP3' through 'JP6'			
Modem	**Control Signal Setting**	**Jumper Settings**	
		Detail	**Pin Settings**
CDM-625	**DM/DSR, CS , RS, CS/CTS,** **RS/RTS, DM/DSR** ***Not Connected***		**N/A** ***(Note: TMI as shipped)***
SLM-5650A	**DM/DSR, CS , RS, CS/CTS,** **RS/RTS, DM/DSR** ***Routed to Traffic modem***		**Pin 1 to Pin 2;** **Pin 3 to Pin 4**

5.4.2 EIA-232/-422, V.35 Interfaces via the CRS-320 and CRS-340 TMIs

Jumpers JP1 and JP2 on the CRS-320 (obsolete) and CRS-340 TMI cards set the functionality of the control signals ***DTR/DSR*** and ***RTS/CTS***. **Figure 5-6** and **Figure 5-7** show these TMIs as shipped from the factory, with the JP1 and JP2 jumper settings open.

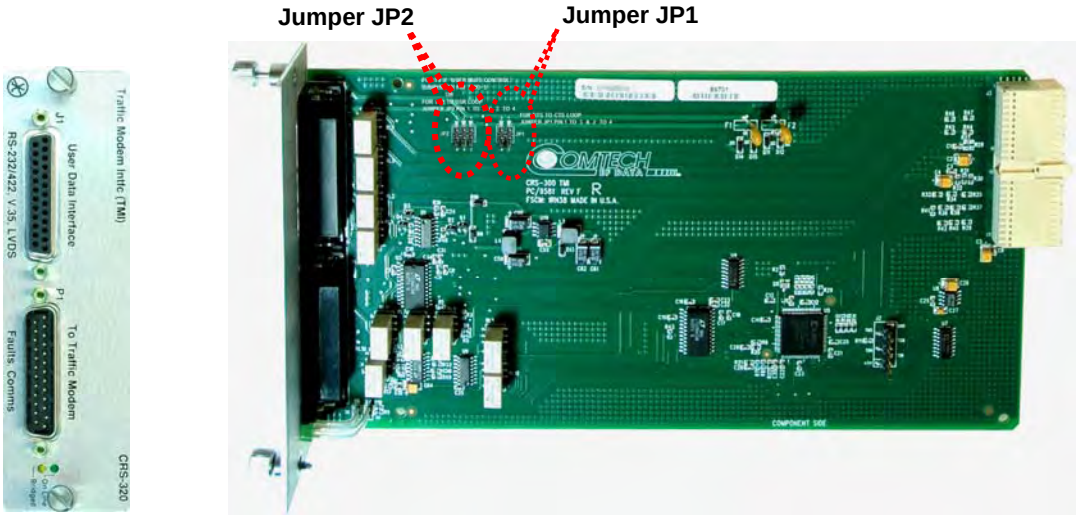


Figure 5-6. CRS-320 EIA-232/EIA-422 TMI Card (Jumpers shown open)

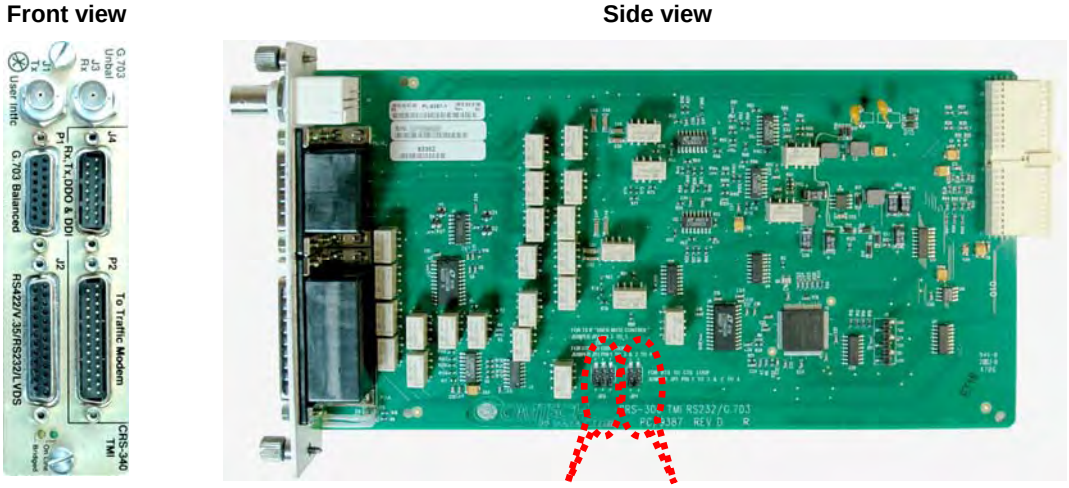


Figure 5-7. CRS-340 EIA-232/-422/G.703 TMI Card (Jumpers shown open)

Table 5-5 illustrates the control signal configuration JP1 and JP2 jumper settings available on the CRS-320 (obsolete) and CRS-340 TMIs:

Table 5-5. CRS-320/CRS-340 Jumper Settings

Jumper 'JP1'		
Control Signal Setting	**Jumpers**	**Settings**
RTS/CTS Open Circuit **(TMI as-shipped)**		**None**
RTS to CTS Loop		**1 to 3** **2 to 4**

Jumper 'JP2'		
Control Signal Setting	**Jumpers**	**Settings**
DTR/DSR Open Circuit **(TMI as-shipped)**		**None**
DTR to DSR Loop		**1 to 3** **2 to 4**
TX IF **"User Mute Control"** Connects User DB-25 Pin 23 to Online Modem's "Tx_IF_Mute_L": 0 = Mute = Tx_IF **Off** 1 = No Mute = Tx_IF **On**		**3 to 5**

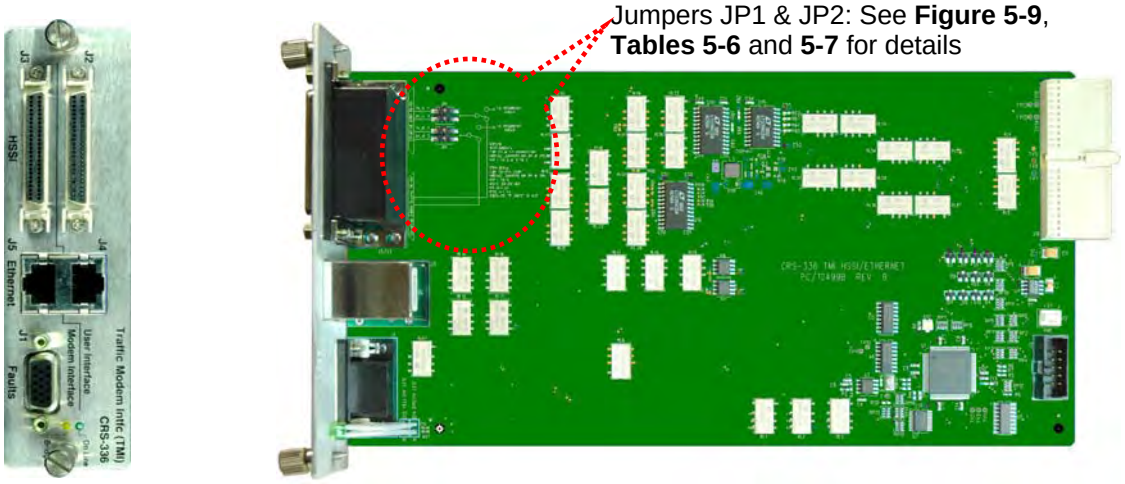
Note: These jumper settings are available *only* on the following TMI versions:

- For the CRS-320 (obsolete) – **Rev. F. and later** versions;
- For the CRS-340 – **Rev. D and later** versions.

5.4.3 HSSI Interfaces via the CRS-336 TMI

Figure 5-8 and **Figure 5-9** depict the CRS-336 TMI (CEFD P/N PL/12499 Rev B or later). Jumpers JP1 & JP2 settings are factory-shipped as indicated. For modem-specific operations, observe the following:

- For CDM-625 modems, the jumper settings for 'CA to TA' Loop are as follows: Pin 1 to Pin 3 (JP1 *and* JP2).
- For SLM-5650A modems,the jumpers settings are as follows: Pin 1 to Pin 2; Pin 3 to Pin 4 (JP1 *and* JP2).



Front view **Side View**

Figure 5-8. CRS-336 HSSI or Ethernet TMI Card

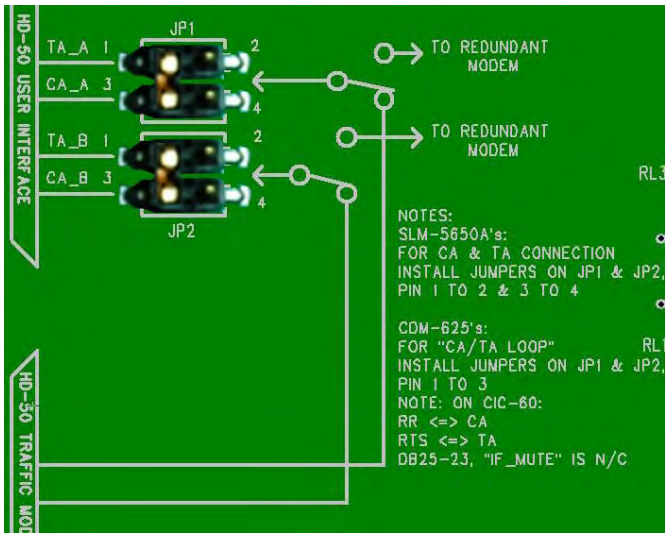


Figure 5-9. CRS-336 Jumpers JP1 & JP2 Detail (as shipped)

Table 5-6. CRS-336 Jumper 'JP1' Settings

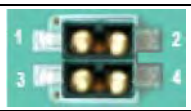
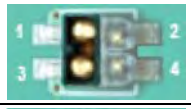
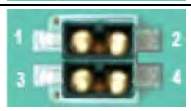
User Interface Jumper 'JP1'			
Modem	**Control Signal Setting**	**Jumper Settings**	
		Detail	**Pin Settings**
CDM-625	**TA_A to CA_A** ***Loop Connected at User HSSI Connector***		**Pin 1 to Pin 3** ***(Note: TMI as shipped)***
SLM-5650A	**TA_A & CA_A** ***Routed to online modem***		**Pin 1 to Pin 2;** **Pin 3 to Pin 4**

Table 5-7. CRS-336 Jumper 'JP2' Settings

User Interface Jumper 'JP2'			
Modem	**Control Signal Setting**	**Jumper Settings**	
		Detail	**Pin Settings**
CDM-625	**TA_B to CA_B** ***Loop Connected at User HSSI Connector***		**Pin 1 to Pin 3** ***(Note: TMI as shipped)***
SLM-5650A	**TA_B & CA_B** ***Routed to online modem***		**Pin 1 to Pin 2;** **Pin 3 to Pin 4**

5.4.4 HSSI Interface via the CRS-370 TMI

Jumper J2 on CRS-370 TMI Card selects the functionality of the control signals ***CA*** and ***TA***. **Figure 5-10** shows this TMI as shipped from the factory, with the J2 jumper open.

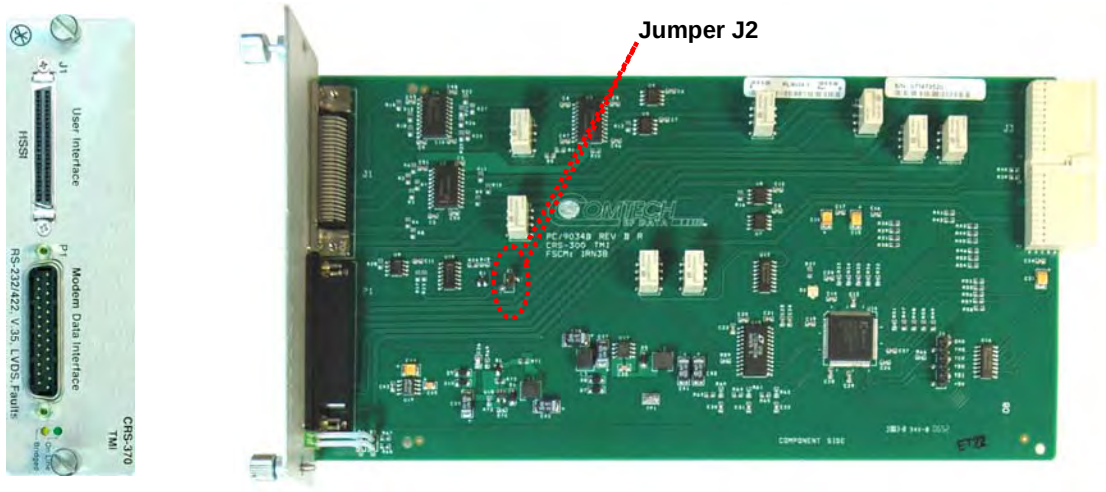
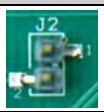


Figure 5-10. CRS-370 HSSI to LVDS TMI Card (Jumper shown open)

Table 5-8 illustrates the control signal configuration J2 jumper settings available on the CRS-370 TMI.

Table 5-8. CRS-370 Jumper Settings

Jumper 'J2'		
Control Signal Setting	**Jumpers**	**Settings**
TA to CA Loop **(TMI as-shipped)**		**None**
• **TA controls TX carrier** • **RR controls CA**		**Installed**

5.5 Switch Configuration

5.5.1 Switch Power

Connect the power cords as follows:

Step	Procedure
1	Ensure that both power supply switches are in the off position before connecting the power supply power cords.
2	Each CRS-300 is supplied with two power cords. Connect the female end of the supplied power cords (one to each power supply power input).
3	Plug both power cords into the power source(s). ***Note**: The auto-sensing power supplies do not require any adjustments.*
4	Once all system connections are in place, turn both power supplies **ON**.

The IEC line input connector for each power supply card contains the ON/OFF switch for that card. Each CRS-300 is shipped with two power supplies, and it is recommended that both be used for maximum reliability.

If only one power supply card is used, mask the fault for the unused power supply as follows:

Step	Procedure
1	Go to the **CONFIG → OPTIONS → MASKS → SW-ALARMS** menu.
2	Select to mask the unused power supply.

Note: The power supplies contain two fuses, one each for line and neutral connections (or L1, L2 where appropriate). These are contained within the body of the connector, behind the small plastic flap.

For continued operator safety, always replace the fuses with the correct type and rating. For 115/230 volt AC operation, use T1A (slow-blow) 20 mm fuses.

5.5.2 Flash Updating

The CRS-300 eliminates the need for updating firmware by physically replacing EPROMs. Instead, the CRS-300 uses 'flash memory' technology internally. This makes software upgrading very simple, and updates can now be sent via the Internet, E-mail, or on CD.

This section outlines the complete upgrading process as follows:

- New firmware update for upgrading the CRS-300 is transferred to a user-provided PC intended for Monitor and Control (M&C) of the CRS-300 1:10 Redundancy Switch.
- By simply connecting the CRS-300 to an available serial port on the user-provided PC, the upgrade can then be performed without opening the CRS-300 chassis.
- Once the firmware update is extracted from the transferred archive file, the upgrade process is executed via use of a utility program, **CCCFlash.EXE**.

Figure 5-11. Flash Update via Internet

5.5.2.1 Firmware File Transfer Procedure

1. **Identify the reflashable product**, firmware number, and version for download.

   Using serial remote control, the current CRS-300 firmware revision can be determined with the following query: <**0/ SWR?**

2. **Create a temporary directory** (folder) on the user-provided external PC.

   Windows: Select **File > New > Folder**, then rename the New Folder to "temp" or another convenient, unused name. Assuming "temp" works, a "*c:\temp*" folder should now be created.

   Note: The **c:** is the drive letter used in this example. Any valid writable drive letter can be used.

   CMD Prompt: At the command prompt (c:\>), type "**mkdir temp**" or "**MD temp**" without quotes (**mkdir** and **MD** stand for *make directory*). This is the same as creating a new folder from Windows. There should now be a "*c:\temp*" subdirectory created (where **c:** is the drive letter used in the example).

3. **Download the correct firmware file** to this temporary folder as shown in **Figure 5-11**.
   - **a) Go online** to: www.comtechefdata.com
   - **b) Click on: *Support*** tab
   - **c) Click on: *Software Downloads*** drop-down *or* hyperlink from ***Support*** page
   - **d) Click on: *Download Flash and Software Update Files*** icon
   - **e) Click on: *(Select a Product Line) Modem Accessories*** hyperlink
   - **f) Click on: *CRS-300*** hyperlink
   - **g) Select** the appropriate firmware hyperlink from the roster of displayed **CRS-300** products/components.

     (***Note:** Choices shown are representative of upgrades available via the Web as of 10/2009. These selections are updated periodically. Contact Comtech EF Data Customer Support for questions regarding the availability of support files for your specific product.)

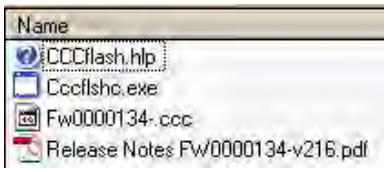
   The flashable files on the download server are organized by product prefix. Depending on the product for which it is intended, the file name may designate the firmware number (verify that the correct firmware number is known – see **Step 1. Identify the reflashable product**); revision letter, if applicable, and firmware version number (V.X.X.X).

   The current version firmware release is provided. If applicable, one version prior to the current release is also available. Be sure to identify and download the desired version.

   The downloadable files are stored in two formats: *.exe (self-extracting) and *.zip (compressed). Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.

   For additional help with "zipped" file types, refer to *PKZIP for Windows*, *WinZip*, or *ZipCentral* help files. *PKZIP for DOS* is not supported due to file naming conventions.

4. **Extract the files** to the temporary folder on the PC, then **verify** the success of the file extraction and transfer via the *dir* command. Using the CDM-600/600L firmware download archive for the CRS-300 as an example, at least four files should be extracted:



   - **CCCflash.hlp**: CEFD Flash Upload Utility Program Help File.
   - **CCCFlash.exe** or **Cccflshc.exe**: CEFD Flash Upload Utility Program, designed to run under Windows 95/98/2000® or Windows NT®.
   - **fw#####x.ccc**, where "#" denotes the firmware number, and "x" denotes the revision letter.
   - **ReleaseNotes*.pdf**, where the firmware number, its revision letter, and the firmware version are typically identified.

   If these four files as identified are displayed, the user should be ready to perform the flash upgrade.

5. **Connect an EIA-232 serial cable** (details are shown in the cable details box on the Uploader screen, as well as in **Appendix A. CABLE DRAWINGS**) from the computer to the remote control port of the Switch.

6. **Run the Upload utility.** The User should follow the instructions presented on the screen, and the upload will take place automatically.

Following the successful upload process, the Switch will automatically restart, running the new version of firmware. During this process, the non-volatile RAM storing the configuration of the Switch will be erased, so the User is then required to re-enter the desired configuration.

5.5.2.1.1 Flash Update Help

Full on-line help is provided with **CCCFlash.EXE**. Additionally, a reference guide is available by selecting the **Flash Update Instructions** link on the *Software Upgrade* Web page (**Figure 5-11**). Please contact Comtech EF Data Customer Support if you have questions or need additional assistance.

5.5.3 CRS-300 Front Panel Configuration

The CRS-300 should show a **GREEN** "Unit Status" LED. If it is **RED**, go to **MONITOR → SW-ALARM** to view the faults. Ensure that the preceding Redundant Modem setup is complete and that it is operating correctly before proceeding.

Use the front panel keypad and display to configure the Switch as described in the following paragraphs.

5.5.3.1 Activate Traffic Modems

The CRS-300 was shipped with no Traffic Modems set to "Active". It is possible to operate the Switch with only some of the 10 slots filled/occupied. A TMI may only be made 'active' if it is present. If there are unused TMIs in the Switch, ensure these are de-activated in the **CONFIG → ACTIVE** menu. An active Traffic Modem is going to be polled regularly by the Switch.

Activate the desired Traffic Modems as follows:

Step	Procedure
1	Go to the **CONFIG → ACTIVE** menu.
2	Activate all desired Traffic Modems, using the [↑] arrows.

After **ENTER** is pressed, the **Switch Status** LED will turn **RED**, until the Switch has polled each of the activated modems and correctly programmed the bridged modem configuration into the Redundant Modem. Once the programming is completed successfully, the **RED** LED will turn **GREEN**.

The Redundant Modem may take several seconds to configure. If the LED remains red, check the communication status using the menus to investigate the problem:

MONITOR → COMM-STATE or MONITOR → SW-ALARMS

Another option is to view the I/O using **MONITOR → I/O.** This menu will show the actual messages to and from the modems. If there are no responses from a modem, check the addressing scheme carefully and verify correct modem communication setups. Communication is slowed to aid viewing.

Do not leave the CRS-300 in this view.

To deactivate a modem, see **Chapter 7.4.5 (CONFIG) ACTIVE MODEMS**.

5.5.3.2 Verify Connection To Each Active Modem

The LEDs are arranged in columns corresponding to each modem, and should accurately reflect the status of each.

Step	Procedure
1	Verify that the Status LED for each modem shows a GREEN light, indicating no faults. (The LEDs [on the Switch] will reflect the LEDs on the front panel of each modem.)
2	Verify that the **Online** LED is lit for all connected TMIs with the modems attached.
3	Verify that the **Online** LED is not lit for the Redundant Modem (for systems not using the CRS-280L IF Switch).
4	Verify that the **Bridge** LED is lit for only one Traffic Modem.

For modems: Use the **INFO** and **MONITOR** menus to view the status of the modems, in addition to viewing the LEDs.

For Switch: Use **MONITOR → COMM-STATE** to verify the modems that are responding via remote control.

For real-time monitoring: Use **MONITOR → I/O** to verify the modems that are responding via remote control. Communication is slowed to aid viewing.

Do not leave the CRS-300 in this view.

5.5.3.3 Set Operation Mode

The CRS-300 is shipped in the Auto-Off (i.e. Manual) operating mode. This setting causes the Stored Event LED to blink. The system is operational; however, it is still operating in **Manual** mode. In the menu, this manual mode is called **Auto-off**. While in **Manual** mode, the User can manually select which Traffic Modem will be bridged or backed-up.

While in **Manual** mode, the Switch does not *automatically* react to any Traffic Modem failures it detects. Comtech EF Data recommends that an unattended system be configured to operate in **Auto** mode.

When **Auto** mode is enabled, the first active modem that fails is first bridged by the Redundant Modem, and then backed up.

To enable **Auto** mode:

Step	Procedure
1	Go to the **CONFIG → AUTO** menu and turn on **AUTO** mode.
2	Verify that the Stored Event LED stops blinking.

5.5.3.4 Set Holdoff Period

A *holdoff period* prevents unwarranted backups due to an intermittent fault. When in **Auto** mode, additional delays may be introduced to the backup procedure by setting the number of seconds for "holdoff" before a faulted Traffic Modem cedes operation to the Redundant Modem (*backup*), or operation is returned from the Redundant Modem back to the Traffic Modem (*restore*).

The process is further explained:

> If a fault occurs in a Traffic Modem, and the Redundant Modem operation is fault-free, *backup* is initiated once the configured **Backup Holdoff Period** lapses. However, if the fault clears within the holdoff's configured timeframe, no transfer of operation occurs.
>
> Similarly, if a fault occurs in the Redundant Modem, and the Traffic Modem's operation is fault-free, *restore* is initiated once the configured **Restore Holdoff Period** lapses.

The default holdoff period is 10 seconds (a minimum of 1 second and a maxium of 99 seconds is allowed).

5.5.3.4.1 Set Backup Holdoff Period

If a Traffic Modem fails, the Switch waits for the backup holdoff time to determine two things:

1) Does the Traffic Modem remain faulted?

   and

2) Is the Redundant Modem not exhibiting the same fault?

If the answer is ***yes*** to both questions for the entire backup holdoff time, then the Switch first bridges the faulted modem with the Redundant Modem. If the fault is sustained, then the switchover to the Redundant Modem is completed and the Redundant Modem carries the traffic.

There will be no switchover if the Redundant Modem is faulted. Ensure that the Holdoff times are long enough (default = 10 seconds) for the Redundant Modem to be configured and to lock onto the signal.

Note: If the CDM-Qx/QxL configuration includes Carrier-in-Carrier® this holdoff time should be no less than 8 seconds.

To set the **Backup Holdoff Period**:

Step	Procedure
1	Go to the **CONFIG → OPTIONS → HOLDOFFS** menu.
2	Change the **BACKUP HOLDOFF** to any number in the range of 1 to 99 seconds.

5.5.3.4.2 Set Restore Holdoff Period

The "**Restore Holdoff**" setting, which is also programmable from 1 to 99 seconds, determines the Switch's ability to automatically put a backed-up Traffic Modem online again if its fault clears.

Normally, a failed modem that was taken offline will remain offline indefinitely. If the fault clears, traffic will be returned to the unit (in Auto mode) only if another Traffic Modem then fails.

If the fault on the originally failed modem has been clear for the full programmed Restore Holdoff time, the Switch places that modem back online, and bridges the newly faulted modem. If the new fault is sustained, the Redundant Modem can then be used to backup the newly faulted modem.

If the Priority selection (see **Chapter 7.4.3 CONFIG → OPTIONS→ PRIORITY**) is not enabled, the Switch deals with Traffic Modem failures on a "first come, first serve" basis. If the User sets the Switch to bridge the highest priority circuit, switching time will be minimized in the event of a failure. If two faults occur simultaneously and are both sustained for the holdoff time, the lower-numbered circuit will be backed up.

To set the **Restore Holdoff Period**:

Step	Procedure
1	Go to the **CONFIG → OPTIONS → HOLDOFFS** menu.
2	Change the **RESTORE HOLDOFF** to any number in the range of 1 to 99 seconds.

5.5.3.5 Set Alarm Masking

Another way to adjust the Switch's reaction in Auto mode is to mask modem faults. The User may disable modem Rx, Tx or both fault types so that the Switch does not react to them. This masking prevents the Switch from taking automatic action and prevents the logging of the faults in the stored events list.

These masks are global to all the modems attached to the Switch.

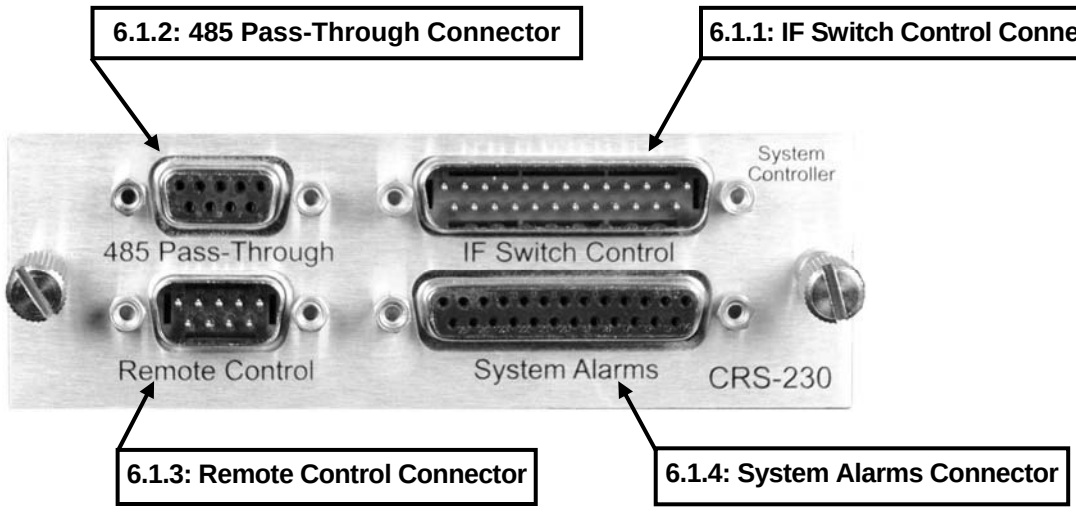
To set **Alarm Masks**:

Step	Procedure
1	Go to **CONFIG → OPTIONS → MASKS → MODEM-ALARMS**.
2	Set the mask parameters as desired.

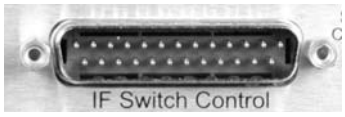
In the event that a second fault occurs, another way to influence Switch behavior is via Priority Mode. For detailed information on Priority Mode, refer to **Chapter 7.4.3 CONFIG → OPTIONS→ PRIORITY**.

Chapter 6. CONNECTOR PINOUTS

6.1 CRS-230 Controller Connectors



6.1.1 IF Switch Control – DB-25M Connector



The DB-25M IF Switch Control connector is cabled directly to the corresponding connector on the CRS-280 or CRS-350, if used. This supplies power to the CRS-280/350, along with the logic interface to drive the currently selected terrestrial modem, and to decide whether the system is in bridged or backup mode. The CRS-280/350 performs the same bridging and backing up functions of the Tx and Rx IF signals to match what the CRS-300 does to the terrestrial data signals.

6.1.2 485 Pass-Through – DB-9F Connector

Table 6-1 indicates the pinout for the DB-9F 485 Pass-Through connector, used only with the CDM-Qx/QxL modems.

Table 6-1. 485 Pass-Through User Data Connector

Pin	Description	Direction
1	Ground	
2	EIA-232 Transmit Data	Out
3	EIA-232 Receive Data	In
4	Reserved - do not connect to this pin	
5	Ground	
6	EIA-485 Receive Data B **(see note)**	In
7	EIA-485 Receive Data A **(see note)**	In
8	EIA-485 Transmit Data B	Out
9	EIA-485 Transmit Data A	Out

Note: Use for 2-wire EIA-485 operation.

6.1.3 Remote Control Connector – DB-9M Connector

The DB-9M Remote Control connector provides access to the remote control ports of the Switch, both EIA-232 and EIA-485. **Table 6-2** provides the pinout information.

Table 6-2. Remote Control Connector

Pin	Description	Direction
1	Ground	
2	EIA-232 Transmit Data	Out
3	EIA-232 Receive Data	In
4	Reserved - do not connect to this pin	
5	Ground	
6	EIA-485 Receive Data B **(see note)**	In
7	EIA-485 Receive Data A **(see note)**	In
8	EIA-485 Transmit Data B	Out
9	EIA-485 Transmit Data A	Out

Note: Use for 2-wire EIA-485 operation.

6.1.4 System Alarms – DB-25F Connector

Table 6-3 indicates the pinout for the DB-25F TMI System Alarms connector.

Table 6-3. System Alarms Connector

Pin Description by Mode of Operation		
Pin	**"Show Fault" when Switch loses power (Default)**	**"Show No-Fault" when Switch loses power**
1	Traffic Modem Online Status – Common Common for pins 2-6 and 14-18	Unchanged
14	Traffic Modem #10 Online Status – Normally Open (Note 2)	
2	Traffic Modem #9 Online Status – Normally Open (Note 2)	
15	Traffic Modem #8 Online Status – Normally Open (Note 2)	
3	Traffic Modem #7 Online Status – Normally Open (Note 2)	
16	Traffic Modem #6 Online Status – Normally Open (Note 2)	
4	Traffic Modem #5 Online Status – Normally Open (Note 2)	
17	Traffic Modem #4 Online Status – Normally Open (Note 2)	
5	Traffic Modem #3 Online Status – Normally Open (Note 2)	
18	Traffic Modem #2 Online Status – Normally Open (Note 2)	
6	Traffic Modem #1 Online Status – Normally Open (Note 2)	
19	No Connection	
7	Ground	
20	Audio Indicator (Gnd = Auto On / Float = Audio Off)	
8	Form C Fault Relay – Common Common for pins 9-13 and 21-24	
21	Switch Unit Fault – Normally Closed	Switch Unit Fault – Normally Open
9	Switch Unit Fault – Normally Open	Switch Unit Fault – Normally Closed
22	Modem Summary Unit Fault –Normally Closed	Modem Summary Unit Fault –Normally Open
10	Modem Summary Unit Fault – Normally Open	Modem Summary Unit Fault – Normally Closed
23	Modem Summary Tx Traffic Fault – Normally Closed	Modem Summary Tx Traffic Fault – Normally Open
11	Modem Summary Tx Traffic Fault – Normally Open	Modem Summary Tx Traffic Fault – Normally Closed
24	Modem Summary Rx Traffic Fault – Normally Closed	Modem Summary Rx Traffic Fault – Normally Open
12	Modem Summary Rx Traffic Fault – Normally Open	Modem Summary Rx Traffic Fault – Normally Closed
25	Modem Summary DFM Fault – Normally Closed	Modem Summary DFM Fault – Normally Open
13	Modem Summary DFM Fault – Normally Open	Modem Summary DFM Fault – Normally Closed

Notes:

1. "Normally" refers to the NON-FAILED state.
2. Traffic Modem Online Status (Open = Online, Closed = Backup)

6.2 TMI User Data Connectors

6.2.1 EIA-232/422/V.35 – DB-25F Connector (CRS-316)

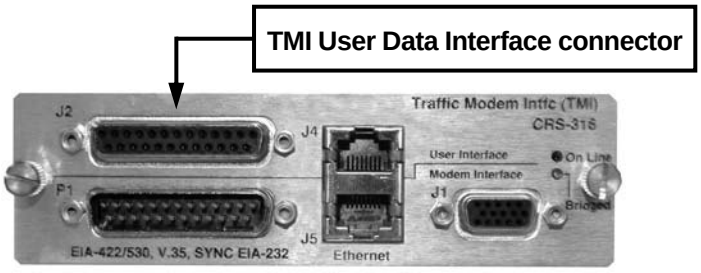


Table 6-4 indicates the pinout for the DB-25F TMI User Data Interface connector (RS232/422/V.35): J2 on the CRS-316.

Table 6-4. EIA-232/422/V.35 Connector

Pin	Generic Signal Description	Direction	EIA-422/ RS 530	V.35	EIA-232	Circuit No.
1	Shield	-	Shield	FG	AA	101
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
4	Request to Send A / Ready for Receiving A	DTE to Modem	RS A	RS A		
6	DCE Ready A	Modem to DTE	DM_A	DM_A		
7	Signal Ground	-	SG	SG	AB	102
8	Receiver Ready A	Modem to DTE	RR A	RLSD *	CF	109
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
10	Receiver Ready B	Modem to DTE	RR	B	-	109
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
12	Internal Transmit Clock B	Modem to DTE	ST B	SCT B	-	114
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
15	Internal Transmit Clock A	Modem to DTE	ST A	SCT A	DB	114
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
19	Request to Send B / Ready for Receiving B	DTE to Modem	RS B	RS B		
22	DCE Ready B	Modem to DTE	DM_B	DM_B		
23	Not Used					
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113

Notes:

1. Receiver-Ready is an EIA-232-level control signal on a V.35 interface.
2. 'B' signal lines are not used for EIA-232 applications.
3. For X.21 operation, use the EIA-422 pins, but ignore Receive Clock if the modem is DTE, and ignore Transmit clocks if the modem is DCE.

6.2.2 EIA-232/422/V.35/LVDS – DB-25F Connector (CRS-320/340)

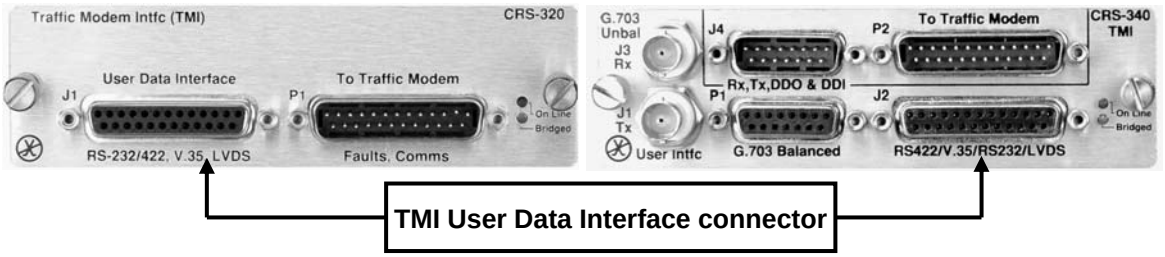


Table 6-5 indicates the pinout for the DB-25F TMI User Data Interface connector (RS232/422/V.35/LVDS): J1 on the CRS-320 (obsolete), and J2 on the CRS-340.

Table 6-5. EIA-232/422/V.35/LVDS Connector

Pin	Generic Signal Description	Direction	EIA-422/ RS 530	V.35	EIA-232	Circuit No.
1	Shield	-	Shield	FG	AA	101
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
7	Signal Ground	-	SG	SG	AB	102
8	Receiver Ready A	Modem to DTE	RR A	RLSD *	CF	109
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
10	Receiver Ready B	Modem to DTE	RR	B	-	109
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
12	Internal Transmit Clock B	Modem to DTE	ST B	SCT B	-	114
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
15	Internal Transmit Clock A	Modem to DTE	ST A	SCT A	DB	114
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
23	External Carrier Off (EIA-232 '1' or TTL 'low')	DTE to Modem	-	-	-	-
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113

Notes:

1. Receiver-Ready is an EIA-232-level control signal on a V.35 interface.
2. DO NOT connect signals to pins which are not shown - these pins are reserved for use by the redundancy system.
3. 'B' signal lines are not used for EIA-232 applications.
4. For X.21 operation, use the EIA-422 pins, but ignore Receive Clock if the modem is DTE, and ignore Transmit clocks if the modem is DCE.

6.2.3 ASI – BNC Connectors (CRS-325)

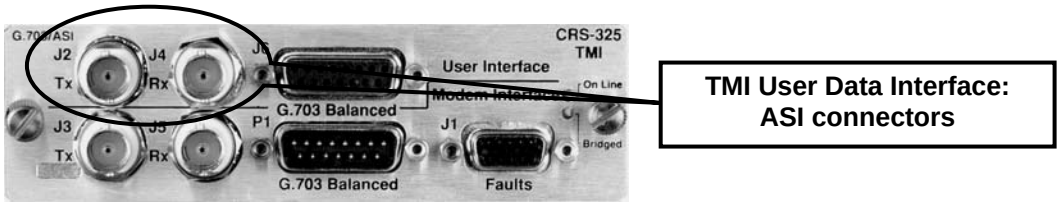


Table 6-6 indicates the TMI User Data Interface BNC connectors (ASI) on the CRS-325.

Table 6-6. ASI Connectors

BNC Connector	TMI CRS-325 Ref Des	Description	Direction
Tx	J2	Tx, ASI	In
Rx	J4	Rx, ASI	Out

6.2.4 8 kHz IDR Connector – RJ-45F (CRS-330)

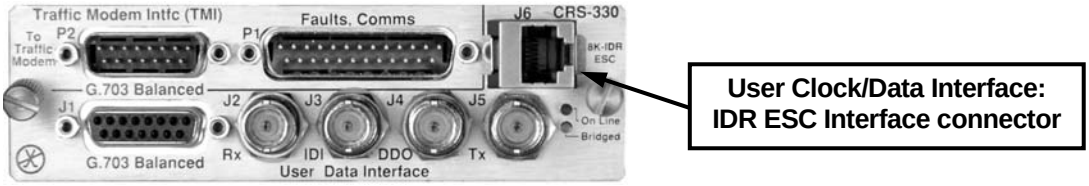


Table 6-7 indicates the RJ-45F connector on the CRS-330 TMI that serves as the user interface to the EIA-422 clock and data for the 8 kHz IDR Engineering Service Channel.

Table 6-7. 8 kHz – IDR ESC Connector

Pin #	Signal Function	Name	Direction
1	Tx Data+	SD+	In
2	Tx Data-	SD-	In
3	Rx Data+	RD+	Out
4	Tx Clock+	ST+	Out
5	Tx Clock-	ST-	Out
6	Rx Data-	RD-	Out
7	Rx Clock+	RT+	Out
8	Rx Clock-	RT-	Out

6.2.5 Balanced G.703 – DB-15F Connector (CRS-325/330/340)

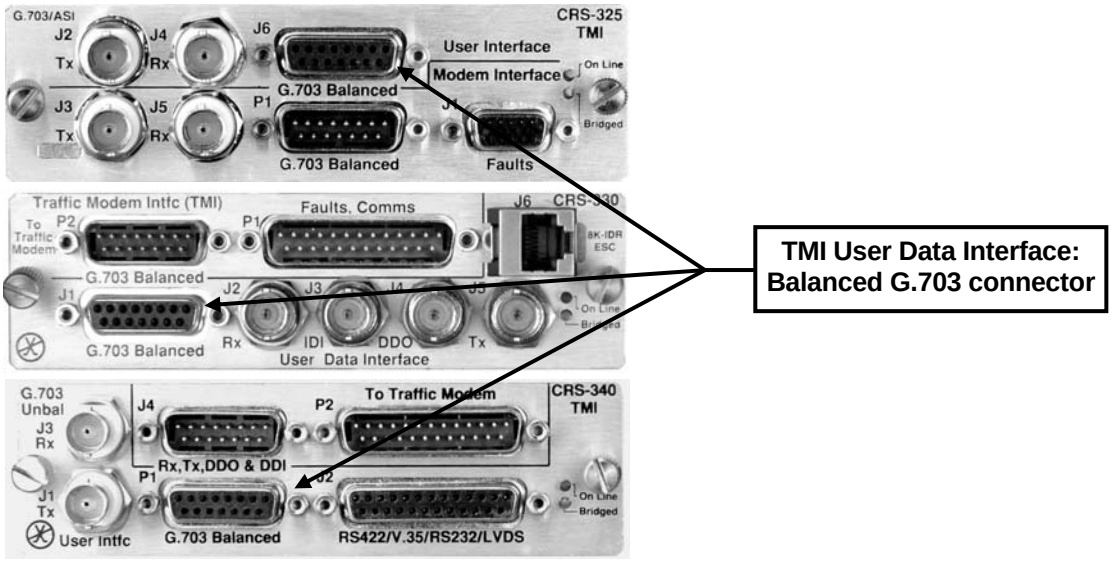


Table 6-8 indicates the pinout for the DB-15F TMI User Data Interface connector (Balanced G.703): Located at J6 on the CRS-325; J1 on the CRS-330; and P1 on the CRS-340.

Table 6-8. Balanced G.703 Connector

Pin	Signal Description	Name	Direction
1*	Tx, Drop Data Input (-)	DDI–	In
9*	Tx, Drop Data Input (+)	DDI+	In
2	Ground	GND	
10	Not Used		
3*	Rx, Insert Data Output (-)	IDO–	Out
11*	Rx, Insert Data Output (+)	IDO+	Out
4	Ground	GND	
12	Drop Data Output (-)	DDO–	Out
5	Drop Data Output (+)	DDO+	Out
13	Insert Data Input (-)	IDI–	In
6	Insert Data Input (+)	IDI+	In
14	Not Used		
7	Not Used		
15	Not Used		
8	Not Used		

*** Use for all non-Drop and Insert and T2/E2 balanced applications.**

6.2.6 Unbalanced G.703 – BNC Connectors (CRS-325/330/340)

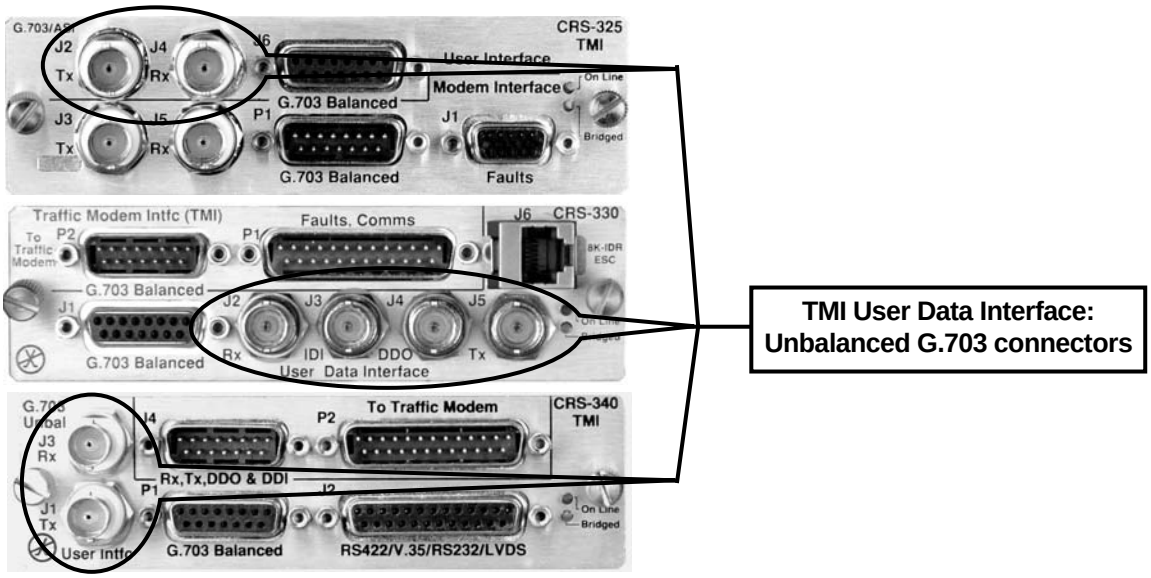


Table 6-9 indicates the TMI User Data Interface BNC connectors (Unbalanced G.703) on the CRS-325, CRS-330 and CRS-340.

Table 6-9. Unbalanced G.703 Connectors

BNC Connector	TMI CRS-325 Ref Des	TMI CRS-330 Ref Des	TMI CRS-340 Ref Des	Description	Direction
Rx-IDO	J4	J2	J3	Rx, G.703	Out
Tx-IDI	J2	J5	J4	Tx, G.703	In
IDI	—	J3	—	Insert data input	In
DDO	—	J4	—	Drop data output	Out

6.2.7 Unbalanced G.703 – 4-Port BNC Connectors (CRS-345)

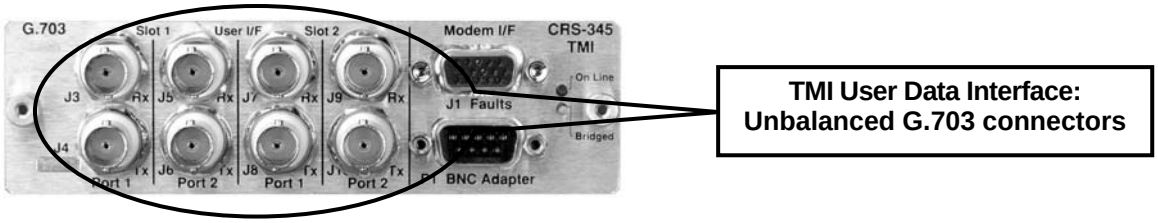


Table 6-10 indicates the TMI User Data Interface multiport BNC connectors (Unbalanced G.703) on the CRS-345.

Table 6-10. Unbalanced G.703 Connectors

BNC Connector	Slot 1		Slot 2		Description	Direction
	Port 1 Ref Des	Port 2 Ref Des	Port 1 Ref Des	Port 2 Ref Des		
Rx	J3	J5	J7	J9	Rx, G.703	Out
Tx	J4	J6	J8	J10	Tx, G.703	In

6.2.8 HSSI – HD-50F Connector (CRS-336/370)

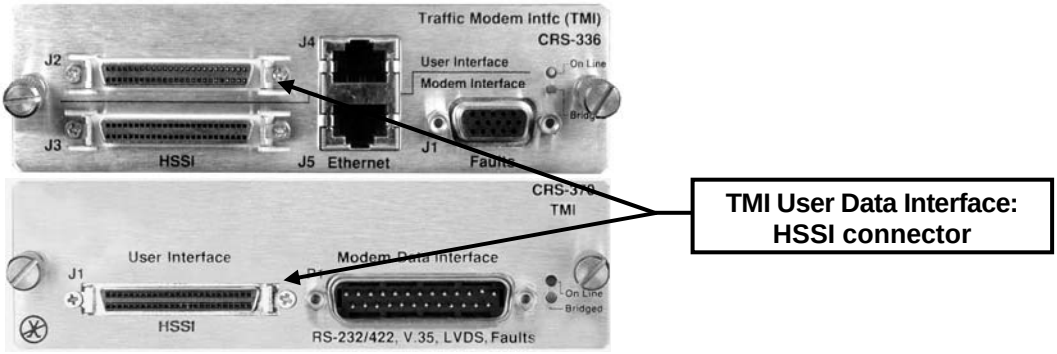


Table 6-11 is for the HD-50F SCSI-II TMI User Data Interface connector (HSSI): J2 on the CRS-336, and J1 on the CRS-370.

Table 6-11. HSSI Connector

Pin # (+, -)	Signal Function	HSSI Signal	RS613 Circuit	Circuit Direction
1, 26	Signal Ground	SG	102	
2, 27	Receive Timing	RT	115	from DCE
3, 28	DCE Available	CA	107	from DCE
4, 29	Receive Data	RD	104	from DCE
5, 30	N/A	N/A	N/A	N/A
6, 31	Send Timing	ST	114	from DCE
7, 32	Signal Ground	SG	102	
8, 33	DTE Available	TA	108/2	to DCE
9, 34	Terminal Timing	TT	113	to DCE
10, 35	N/A	N/A	N/A	N/A
11, 36	Send Data	SD	103	to DCE
12, 37	N/A	N/A	N/A	N/A
13, 38	Signal Ground	SG	102	
14,15,17, 18, 39-43	Reserved (to DCE)			not used
16	Tx_Carrier_Off_L [1, 3]	CO	undefined	from DTE
19, 44	Signal Ground	SG	102	
20	Carrier Detect (lock) [1, 2]	CD	undefined	from DCE
21-24, 46-49	Reserved (to DTE)		undefined	not used
25, 50	Signal Ground	SG	102	

Notes:

1. Noted signal function names are non-HSSI defined signals. On Cisco™ routers, there is no connection to those pins.
2. TTL - output.
3. TTL or EIA-232 (active low) input.

6.2.9 10/100/1000 Ethernet – RJ-45F Connector (CRS-316/336)

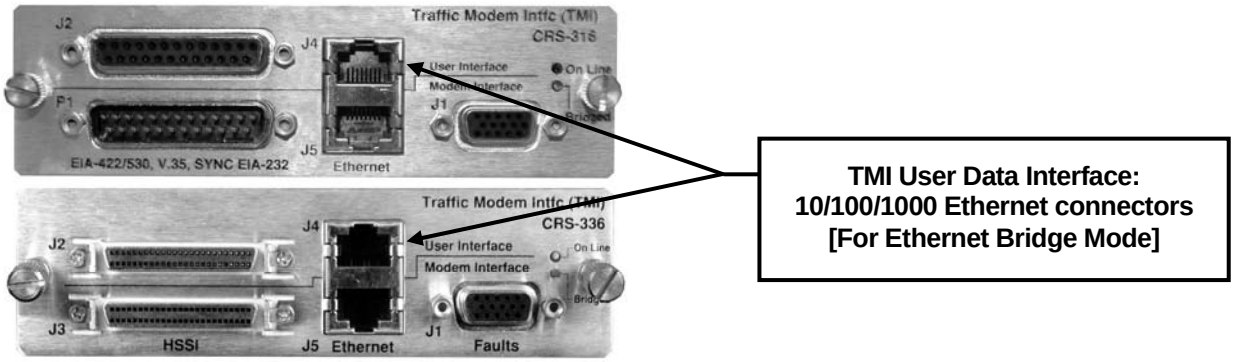


Table 6-12 indicates the pinout for the RJ-45F TMI User Data Interface connector (10/100/1000 Ethernet): J4 on the CRS-316 and CRS-336.

Table 6-12. 10/100/1000 Connector

Pair No.	Pin No.
1	5
	4
2	1
	2
3	3
	6
4	7
	8

6.2.10 Quad E1 – RJ-48F Connectors (CRS-365)

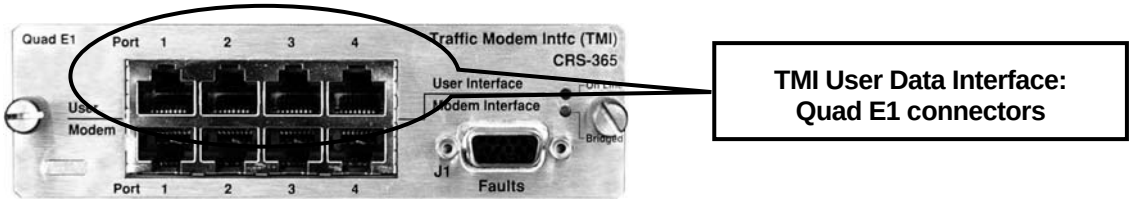


Table 6-13 indicates the pinout for the four (4) RJ-48F TMI User Data Interface connectors (Quad E1): Ports 1 through 4 on the CRS-365.

Table 6-13. Quad E1 Connector (Typical Ports 1 through 4)

Pin #	Name (*where* Port # = Port 1, 2, 3 or 4)	Direction
1	Port # Tx+	In
2	Port # Tx–	In
3	Gnd	--
4	Port # Rx+	Out
5	Port # Rx–	Out
6	Gnd	--
7	NC	--
8	NC	--

6.2.11 Quad E1 – DB-9F Connectors (CRS-365D)

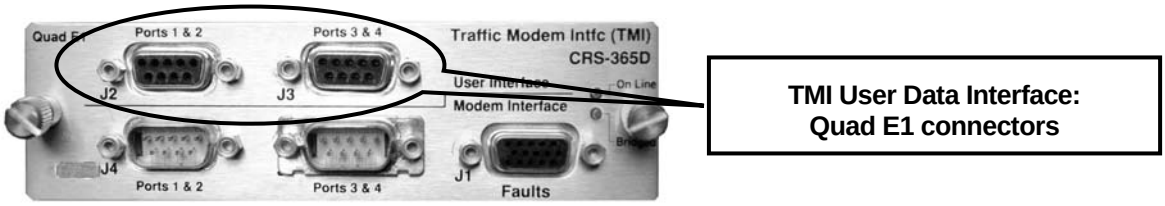


Table 6-14 and **Table 6-15** indicate the pinout for the two (2) DB-9F TMI User Data Interface connectors (Quad E1): J2 and J3 on the CRS-365D.

Table 6-14. Quad E1 Connector (J2)

Pin #	Name	Direction
1	Port 2 Rx-	Out
6	Port 2 Rx+	Out
2	Port 2 Tx-	In
7	Port 2 Tx+	In
3	Gnd	-
8	Port 1 Rx-	Out
4	Port 1 Rx+	Out
9	Port 1 Tx-	In
5	Port 1 Tx+	In

Table 6-15. Quad E1 Connector (J3)

Pin #	Name	Direction
1	Port 4 Rx-	Out
6	Port 4 Rx+	Out
2	Port 4 Tx-	In
7	Port 4 Tx+	In
3	Gnd	-
8	Port 3 Rx-	Out
4	Port 3 Rx+	Out
9	Port 3 Tx-	In
5	Port 3 Tx+	In

Chapter 7. FRONT PANEL OPERATION

7.1 Introduction

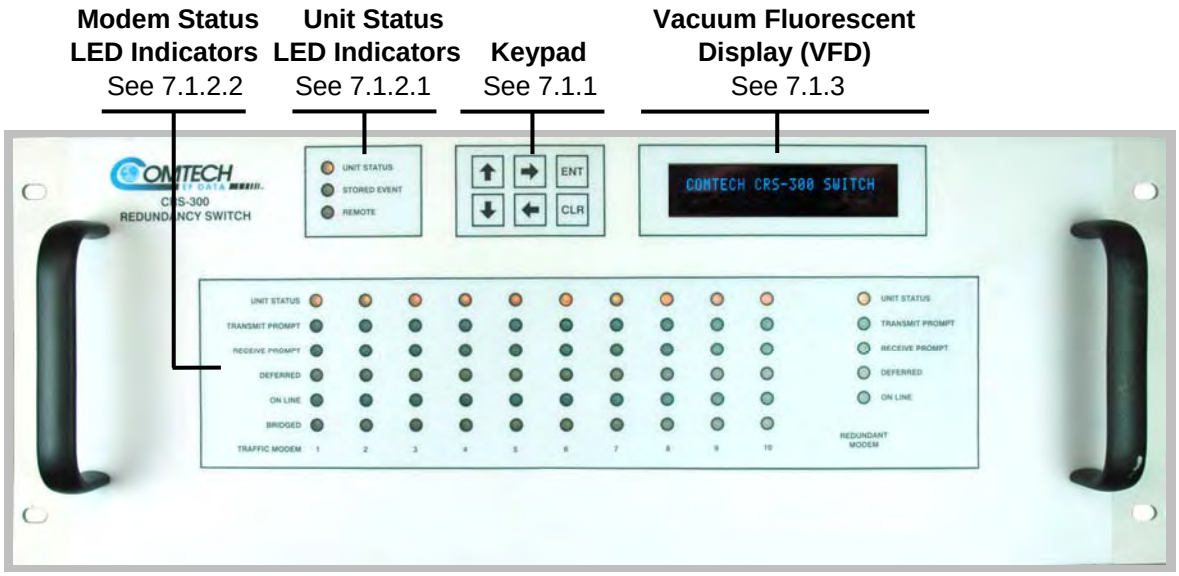
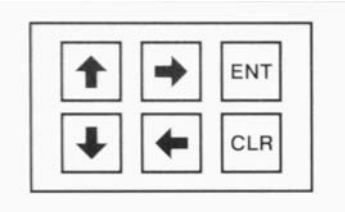


Figure 7-1. CRS-300 Front Panel

The User can fully control and monitor the operation of the CRS-300 from the front panel, using the keypad and display. Nested menus display all available options, and prompt the User to carry out a required action. **Figure 7-1** identifies the control and operation features for the CRS-300, and the sections in this chapter which explain those features in greater detail.

7.1.1 Front Panel Keypad



The CRS-300 front panel keypad contains six individual key switches mounted behind a sealed membrane overlay. The keys have a positive "click" action for tactile feedback.

The six switches are identified as follows:

Switch	Description	Function
↑	**UP ARROW**	Edits the value at the current cursor position, when appropriate. Increments the value of a numeric field.
↓	**DOWN ARROW**	Edits the value at the current cursor position, when appropriate. Decrements the value of a numeric field.
→	**RIGHT ARROW**	Moves the cursor, when it is displayed, to the right.
←	**LEFT ARROW**	Moves the cursor, when it is displayed, to the left.
ENT	**ENTER**	Accepts an edited entry. Most menus prompt User to press this key by displaying the text "**PRESS ENTER**", "**ENTER**", or "**ENT**". Press [ENT] to ***accept*** the entry and display the previous menu.
CLR	**CLEAR**	Exits the current operation and displays the previous menu without accepting any configuration changes. Press [CLR] to ***reject*** the entry and display the previous menu.

IMPORTANT

The keypad has an auto-repeat feature. If a key is held down for more than 1 second, the key action will repeat, automatically, at the rate of 15 keystrokes per second. This is particularly useful when editing numeric fields.

7.1.2 Front Panel LED Indicators

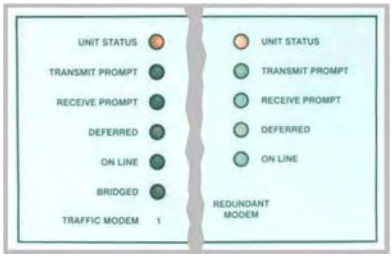
7.1.2.1 Unit Status LED Indicators

The behavior of the three front panel LEDs adjacent to the keypad, which indicate operational status of the CRS-300 switch unit, are described below in **Table 7-1**:

Table 7-1. Unit Status LED Indicators

LED	Color	Condition
UNIT STATUS	**Green**	Normal operation (no Switch Faults)
	Red	Switch Fault, e.g., PSU fault or COMMS failure
STORED EVENT	**Off**	No Stored Events
	Orange	Switch has Stored Events
	Orange (Flashing)	**CAUTION:** Switch is in Manual mode
REMOTE	**Off**	Switch in Local Mode – remote monitoring is possible; remote configuration control is not allowed
	Orange	Switch in Remote Mode – configuration changes are disabled via the front panel keypad

7.1.2.2 Modem Status LED Indicators



The behavior of the six front panel LEDs which indicate operational status for up to 10 Traffic Modems, and the five front panel LEDs which indicate operational status for the Redundant Modem, are described below in **Table 7-2**:

Table 7-2. Modem Status LED Indicators

LED	Color	Condition
UNIT STATUS	**Green**	Normal operation (no Unit, Tx or Rx Fault)
	Red	• Unit Fault • Rx and Tx fault for SLM-5650/5650A
	Orange	• Tx or Rx Fault • TMI not installed
TRANSMIT PROMPT	**Green**	Normal operation (no Tx Fault)
	Off	Tx Fault
RECEIVE PROMPT	**Green**	Normal operation (no Rx Fault)
	Off	Rx Fault
DEFERRED (CDM-600, CDM-625)	**Off**	Normal operation (no Deferred Maintenance Alarm)
	Orange	Deferred Maintenance Alarm
ONLINE	**Green**	Normal operation (Modem traffic active to/from User)
	Off	No modem traffic active to/from User
BRIDGED	**Orange**	Traffic modem is bridged or in “Hot Standby” – verifies that Redundant Modem is configured identically to this modem
	Off	Not bridged

7.1.3 Front Panel Vacuum Fluorescent Display (VFD)

The Front Panel **V**acuum **F**luorescent **D**isplay (VFD) is an active display showing two lines of 24 characters each. It produces a blue light, the brightness of which can be controlled by the user. Compared to a **L**iquid **C**rystal **D**isplay (LCD), it has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

On most menu displays, the User will observe a flashing solid block cursor, which blinks at a once-per-second rate. This indicates the currently selected item, digit, or field:

```
CONFIG:  MANUAL  AUTO[ON]
OPTIONS   REMOTE   ACTIVE
```

Where this solid block cursor would obscure the item being edited (for example, a numeric field) the cursor will automatically change to an underline cursor:

```
ACTIVE MODEMS:  (ENTER)
 1 2 3 – 5 6 – 8 - 10
```

If the User were to display the same screen for weeks at a time, the display could become 'burnt' with this image. To prevent this, the unit has a 'screen saver' feature, which will activate after 1 hour. The top line of the display will show the Switch ID (which can be entered by the User) and the bottom line will show the current status of the Switch, followed by **'Press any key...'**:

```
---------------
Press any key...
```

The message moves from right to left across the display, then wraps around. Pressing any key restores the previous display.

7.1.4 Opening Screen

```
COMTECH  CRS-300 SWITCH
FOR CDM-XXX MODEM VX.XX
```

A 'welcome screen' similar to what is pictured here displays whenever power is first applied to the unit. Pressing any key takes the User to the top-level **SELECT:** menu.

7.2 CRS-300 Menu Structure

Figure 7-2 shows the menu structure of the CRS-300. The menu, branches, and applicable submenus are described in detail in the chapter sections that follow. Note also that, for the purpose of clarity, certain chapter sections may refer to the old Recommended Standard (RS) designation rather than the new designation of the Electronic Industries Association (EIA).

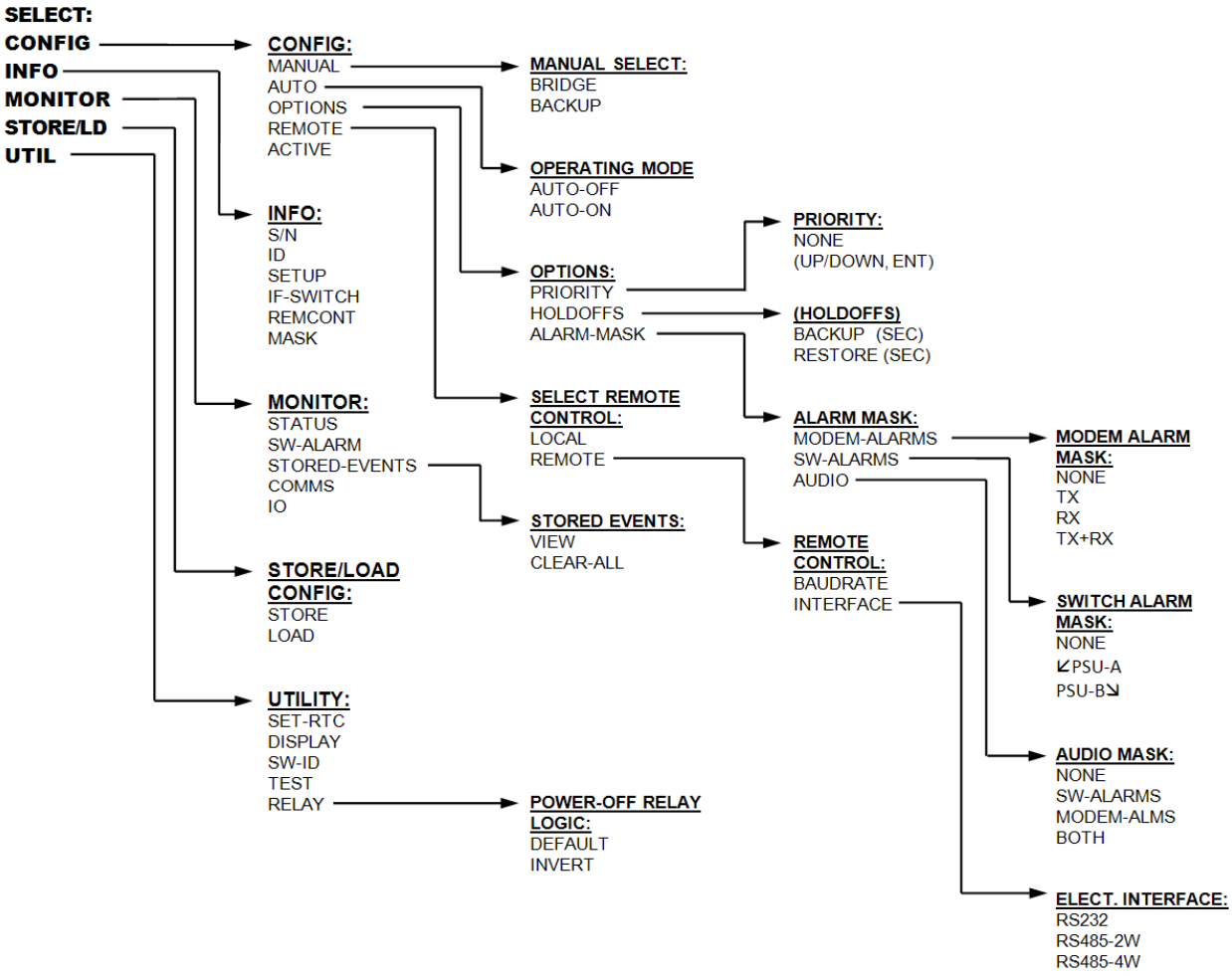


Figure 7-2. CRS-300 Menu Tree

7.3 SELECT (Top-Level) Menu

```
SELECT:   CONFIG   INFO
 MONITOR  STORE/LD  UTIL
```

Move the cursor to the desired choice using the ◄ ► arrow keys, then press **[ENT]**. The following table describes the function of each menu branch (along with the section in this chapter that provides information on that branch and its accompanying submenus):

Selection	Sect.	Menu Branch Description
CONFIG	**7.4**	**(Configuration)** Permits the User to fully configure the Switch.
INFO	**7.5**	**(Information)** Permits the User to view information on the Switch, without having to go into configuration screens.
MONITOR	**7.6**	Permits the User to monitor the status of the Switch and view the log of stored events for both the Switch and its attached modems.
STORE/LD	**7.7**	**(Store/Load)** Permits the User to store and to retrieve up to 10 different Switch configurations.
UTIL	**7.8**	**(Utility)** Permits the User to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.

7.4 SELECT: CONFIG (Configuration)

```
CONFIG:  MANUAL  AUTO[OFF]
 OPTIONS  REMOTE   ACTIVE
```

Move the cursor to the desired choice using the ◄ ► arrow keys, then press **[ENT]**.

The submenus available under the **CONFIG** menu branch are as follows:

Selection	Sect.	Submenu Description
MANUAL	**7.4.1**	Permits the User to select which traffic MODEM the Switch should bridge or backup.
AUTO [OFF/ON]	**7.4.2**	Permits the User to turn Auto mode off or on. The currently selected state is always shown on this menu
OPTIONS	**7.4.3**	Permits the User to set several operating parameters of the Switch that pertain to enabling or disabling the availability of Traffic Modems, the reporting of faults and time delays for responding to faults.
REMOTE	**7.4.4**	Permits the User to define the remote control settings.
ACTIVE	**7.4.5**	Permits the User to activate modems, if a TMI is present.

The Switch may be monitored over the remote control bus at any time. When in Local mode, however, configuration parameters may only be changed through the front panel. Conversely, when in Remote mode, the unit may be monitored from the front panel, but configuration parameters via may only be changed remote control bus.

7.4.1 CONFIG: MANUAL

```
MANUAL SELECT:
BRIDGE:02   BACKUP:02
```

The User may manually select which Traffic Modem is to be bridged or backed-up. When the Switch is in **Manual** mode (**Auto** is **OFF**), both of these selections are available. Use the ◄ ► arrow keys to select between Bridge and Backup. Use the ▲ ▼ arrow keys to scroll through all active Traffic Modems, skipping inactive modem slots. Press **[ENT]** to configure.

When in **Auto** mode, the Switch has control and will automatically backup any active Traffic Modem based on its fault relay activity. In this case, the Manual Select display would appear as shown below:

```
MANUAL SELECT:
BRIDGE:02   BACKUP: AUTO
```

In Auto mode, the **BACKUP** selection is unavailable for manual selection, but the modem being bridged may be changed. Use the ▲ ▼ arrow keys to scroll through all active Traffic Modems, skipping inactive modem slots. Press **[ENT]** to configure.

When the Switch is in Backup mode, the Redundant Modem is online. In this event, the User may not alter the bridge/backup state, and a message is shown instead of the menu:

```
MANUAL SELECT:
SWITCH IS IN AUTO MODE
```

Press **CLR** or **ENT** to return to the previous menu.

The Switch learns and retains the configuration of all of the active modems in the set-up. This configuration information is used to program the Redundant Modem to match the configuration of the modem being bridged.

7.4.2 CONFIG: AUTO [AUTO-OFF or AUTO-ON]

```
OPERATING MODE:
AUTO-OFF  AUTO-ON (ENTER)
```

Select **AUTO-OFF** or **AUTO-ON** using the ◄ ► arrow keys, then press **[ENT]**.

When off (**Manual** mode), the Switch does not respond automatically to any modem faults and simply performs whatever manual setting the User performs via the Manual-select previous menu. The **STORED EVENT** indicator blinks when in **Manual** mode to alert the User that the Switch is effectively not in use.

7.4.3 CONFIG: OPTIONS

```
OPTIONS:       PRIORITY
  HOLDOFFS   ALARM-MASK
```

These options define how the Switch will react to various faults. Select **PRIORITY**, **HOLDOFFS**, **or ALARM-MASK,** using the ◄ ► arrow keys, then press **[ENT]**.

CONFIG: OPTIONS → PRIORITY

If **PRIORITY** is selected:

```
PRIORITY:    POSITION 2
    UP/DOWN, THEN ENTER
```

If one link is considered more important than all others, this feature enables the User to prioritize that link. For example, if the Switch is in Auto mode and it is already backing-up a link that is not a priority link. If the priority link now fails, the link will be restored regardless of its fault state. The priority link will now be bridged and then backed up.

Note: Only activated TMI slots will be available for selection as the ▲ ▼ arrow keys are pressed.

CONFIG: OPTIONS → HOLDOFFS

If **HOLDOFFS** is selected:

```
BACKUP HOLDOFF SEC:  05
RESTORE HOLDOFF SEC: 10
```

Use the ◄ ► arrow keys to switch between the Backup and Holdoff settings, then use ▲ ▼ arrow keys to adjust the time (in seconds). Both Holdoffs can be set from 1 to 99 seconds.

When the Backup and Restore Holdoff times have been edited, press **[ENT]** to configure.

The User may set the Holdoffs (delay times) between the Switch's modem alarm detection and its reaction to the event. These Holdoffs are only applicable when the Switch is in **Auto** mode. When an active modem exhibits an unmasked fault, the Switch bridges it with the Redundant Modem and checks that the latter is not also faulted. If there is no fault, the **Backup Holdoff** determines how long the Switch will wait before performing the actual backup, or switchover of traffic to the Redundant Modem.

Note: If the CDM-Qx configuration includes Carrier-in-Carrier®, this Holdoff time should be no less than 8 seconds.

When the Switch is currently backing up a Traffic Modem, and that offline modem's fault clears, the Switch will continue to back it up unless another active modem becomes faulted. In this case, the **Restore Holdoff** is the length of time that the originally faulted modem must stay unfaulted before the Switch will automatically put it back online so that the Redundant Modem is available to bridge the newly faulted modem.

CONFIG: OPTIONS → ALARM-MASK

If **ALARM-MASK** is selected:

```
ALARM MASK:  MODEM-ALARMS
SW-ALARMS  AUDIO  (ENTER)
```

Select **MODEM-ALARMS**, **SW-ALARMS**, or **AUDIO**, then press **[ENT]**. The Switch logs and reacts to both its own faults and modem faults. Either type of faults may be masked using this submenu. In addition, an audible buzzer can be enabled as an additional indicator.

CONFIG: OPTIONS → ALARM-MASK → MODEM-ALARMS

If **MODEM-ALARMS** is selected:

```
MODEM ALARM MASK:  NONE
TX  RX  TX+RX    (ENTER)
```

Select **NONE**, **TX**, **RX**, or **TX+RX**, then press **[ENT]**.

The User may mask Transmit or Receive Traffic faults (or both) from being reacted to by the Switch. This not only prevents the Switch from performing Auto mode functions when these modem faults are sensed, but also keeps the faults from being logged by the Switch.

NOTE: These selections are global to all the modems. If masking of individual modem faults is desired, it should be done directly on the modem. Unmasked modem faults are logged on active modems only.

CONFIG: OPTIONS → ALARM-MASK → SW-ALARMS

If **SW-ALARMS** is selected:

```
SWITCH ALARM MASK: NONE
↙PSU-A  PSU-B↘  (ENTER)
```

Select **↙PSU-A** or **PSU-B↘,** then press **[ENT]**.

The User may select which, if either, of the plug-in power supply units needs to masked. Only one of the units can be masked at a time. Normally this would be done if the User wishes to run with only one supply, or if a bad supply had been removed for service or replacement.

CONFIG: OPTIONS → ALARM-MASK → AUDIO

If **AUDIO** is selected:

```
AUDIO MASK:  NONE  SW-ALMS
MODEM-ALMS  BOTH   (ENTER)
```

Select **NONE**, **SW-ALMS**, **MODEM-ALMS**, or **BOTH**, then press **[ENT]**.

For all Switch or modem alarms that are unmasked, the User may select which alarm types should force the Switch to react with an audible buzzer located behind the front panel. In addition, a relay closure to ground activates on pin 20 of the System Alarms connector so that the User may attach other indicators.

7.4.4 CONFIG: REMOTE

```
SELECT REMOTE CONTROL:
LOCAL REMOTE (PRESS ENT)
```

Select **LOCAL** or **REMOTE** using the ◄ ► arrow keys, then press **[ENT]**.

CONFIG: REMOTE → LOCAL

If **LOCAL** is selected, remote control will be disabled, though remote monitoring is always possible.

CONFIG: REMOTE → REMOTE

If **REMOTE** is selected:

```
REMOTE CONTROL: BAUDRATE
INTERFACE   (PRESS ENTER)
```

Select **BAUDRATE** or **INTERFACE**, using the ◄ ► arrow keys, then press **[ENT]**.

CONFIG: REMOTE → REMOTE → BAUDRATE

If **BAUDRATE** is selected:

```
EDIT SWITCH BAUDRATE:
19200 BAUD  (PRESS ENT)
```

The User may select the baud rate of the remote control bus, connected locally to the M&C computer. Change the value by using the ▲ ▼ arrow keys. Values of 300, 1200, 2400, 4800, 9600 and 19200 baud are possible.

Once baudrate has been set, the User should pres **ENT.**

Note: This setting does not affect the internal communications between the Switch and the modems.

CONFIG: REMOTE → REMOTE → INTERFACE

If **INTERFACE** is selected:

```
ELECT. INTERFACE:  RS232
RS485-2W   RS485-4W (ENT)
```

Select **RS232**, **RS485-2W** (2-wire), or **RS485-4W** (4-wire) using the ◄ ► arrow keys, then press **[ENT]**. The User will be further prompted to enter the bus address.

In this example, RS-232 mode is used and the bus address is fixed at 0:

```
IN RS232 MODE THE BUS
ADDRESS IS FIXED AT 0000
```

If in RS-485, the address may be selected. The valid addresses are 1000, 3000, 5000 and 7000 only, as explained in **Appendix C. REMOTE CONTROL** in this manual.

```
EDIT SWITCH BUS ADDRESS:
3000       (PRESS ENTER)
```

The value of the address is changed using the ▲ ▼ arrow keys. The User should then press **[ENT]**.

Note: This setting does not affect the internal communications between the Switch and the modems.

7.4.5 CONFIG: ACTIVE (Active Modems)

```
ACTIVE MODEMS: (ENTER)
1 2 3 - 5 6 - 8 9 10
```

Select which Traffic Modems to activate. Use the ◄ ► arrow keys to select the modem, then use the ▲ ▼ arrow keys to activate or deactivate the modem.

An hyphen (-) appears in place of the modem number if it is deactivated. If a Traffic Modem interface is not plugged into a slot, that position cannot be activated. A modem must be active in order for it to be available to bridge or backup. Once activated, the Switch will expect a modem to be attached, and will poll the modem for status information.

When adding or removing a modem in an ***operating*** 1:N Switch system, it is important to keep the traffic safe, by preventing any contention in the system from an unsuppressed modem Tx carrier.

To add an additional Traffic Modem:

- Attach control, data and IF cables as outlined in **Chapter 4. CABLES AND CONNECTIONS.**
- Configure the modem and Switch as outlined in **Chapter 5. MODEM, RMI/TMI, AND SWITCH CONFIGURATION.**

To remove a Traffic Modem that ***is not being backed-up***:

- De-activate the modem from the Switch configuration (CONFIG: ACTIVE, ▼ arrow for the appropriate TMI/modem position).
- Power-down the modem.
- Detach all cables.

To replace a faulted Traffic Modem that ***is being backed-up*** by the Redundant:

Do not deactivate this modem, as the traffic path must be maintained.

- Detach the IF cables of the faulted modem.
- Power-down the modem.
- Remove all other the cables and remove the modem.
- Install the replacement modem.
- Attach the power cord and power up the modem.
- Attach control, data and IF cables as outlined in **Chapter 4. CABLES AND CONNECTIONS.**
- Configure the modem as outlined in **Chapter 5. MODEM, RMI/TMI AND SWITCH CONFIGURATION.**
- The new Traffic Modem should lock as it is bridging the Redundant Modem. The Switch will then ready and able to cope with any other fault that may occur.

- If desired, the User can go to **Manual** mode, switchover the active traffic from the Redundant Modem onto the Traffic Modem, and then return to **Auto** mode.

7.5 SELECT: INFO (Information)

The **INFO:** submenus provide information on the current configuration of the Switch without risking inadvertent alterations.

```
INFO:  S/N  ID   SETUP
IF-SWITCH  REMCONT  MASK
```

Select **S/N, ID, SETUP, IF-SWITCH, REMCONT** or **MASK** using the ◄ ► arrow keys, then press **[ENT]**.

7.5.1 INFO: S/N

```
SWITCH ID:
------------------------
```

This screen displays the unique serial number assigned to this unit by Comtech EF Data. Press **[ENT]** or **[CLR]** to return to the previous menu.

7.5.2 INFO: ID

```
SWITCH ID:
------------------------
```

This screen displays the User-defined Switch ID string, which is entered via the **UTILITY: SWITCH-ID** submenu. Press **[ENT]** or **[CLR]** to return to the previous menu.

7.5.3 INFO: SETUP

```
TM:  1 2 3 4 5 - 7 - 9 10
AUTO:OFF  BKUP:05  REST:20
```

This screen displays some of the settings configured in the **CONFIG: OPTIONS** menu. Active Traffic Modems are listed on the top line, with Auto mode and the two Holdoff times listed on the bottom.

7.5.4 INFO: IF-SWITCH

```
TRANSPONDER SWITCH IS
       ABSENT
```

This screen displays whether or not a CRS-280(L) IF Transponder Switch is connected to the CRS-300. When an IF Switch is present, the second line will indicate "**PRESENT**", and any offline modem – Redundant or Traffic – will not have its Tx IF muted by the CRS-300.

7.5.5 INFO: REMCONT (Remote Control Info)

```
REM CNTL: ON     RS232
ADDR:0000  9600 BAUD  8N1
```

This screen displays if the unit is in **LOCAL** or **REMOTE** mode, gives details of the electrical interface type, the unit address, the baud rate, and data format. Press **[ENT]** to return to the previous menu.

7.5.6 INFO: MASK (Alarm Mask Info)

```
ALARMS MASKED:  MODEM-TX
MODEM-RX  ↙PSU-A  PSU-B↘
```

This screen displays the alarms that are currently masked. If an alarm is not masked, a blank is displayed in the relevant screen position. Power Supplies A and B cannot be both masked at the same time, but are shown together here to indicate their relative positions on the screen.

7.6 SELECT: MONITOR

```
MONITOR:  STATUS  SW-ALARM
STORED-EVENTS  COMMS   IO
```

Select **STATUS, SW-ALARM, STORED EVENTS, COMMS** or **IO** using the ◄ ► arrow keys, then press **[ENT]**.

7.6.1 MONITOR: STATUS

```
TM 02 IS BRIDGED BY RM
BACKUP HOLDOFF: 05 SEC
```

This display shows the bridged or backup status of the Switch. When the Redundant Modem is not backing up any of the Traffic Modems, the display will show which Traffic Modem is currently being bridged by the Redundant Modem. If Auto mode is on, it will also show the backup holdoff-time should the bridged Traffic Modem fail. If Auto mode is off, the second line displays “OFF”. When the Switch has taken the bridged Traffic Modem offline and replaced it with the Redundant Modem (whether done manually or automatically), the display changes as follows:

```
TM 02 IS BACKED UP BY RM
RESTORE HOLDOFF:  05 SEC
```

The Restore Holdoff time is shown on the second line if Auto mode is on.

7.6.2 MONITOR: SW-ALARM

The following are examples of possible Switch status displays, along with suggestions to assist the User in diagnosing the reason for the fault.

```
SWITCH ALARM:      NONE
```

There are no faults. The front panel LED "Unit Status" should be **GREEN**.

```
SWITCH ALARM:   -12V PS-B
       ↘ IS UNDERVOLTAGE
```

There is a fault. Power supply "B" is under voltage. The front panel LED "Unit Status" will be **RED**.

Suggestions:

- Ensure power supply power cord is connected and the power switch is ON.
- Replace defective power supply module.
- If the second power supply module is not needed, the User can mask this Alarm.

```
SWITCH ALARM: RM PROBLEM
          RM I/O TIMEOUT
```

There is a fault. Communication has been lost to the Redundant Modem. The front panel **LED** "Unit Status" will be **RED**.

Suggestions:

- Check Cable Connections – refer to **Chapter 4. CABLES AND CONNECTIONS.**
- Check Modem Configurations – refer **to Chapter 5. MODEM, RMI/TMI, AND SWITCH CONFIGURATION.**

```
SWITCH ALARM: RM PROBLEM
MGC refused, code:12 TFT
```

There is a fault. COMs are good to the Redundant Modem, but the configuration of the bridged Traffic Modem cannot be configured into the Redundant Modem. The front panel LED "Unit Status" will be **RED**.

Suggestion: Ensure the most capable modem is used for the redundant, with regard to FAST options, installed options, e.g. Turbo card, firmware version, and hardware revision. The code indicates the parameter within the MGC configuration string that is causing the Redundant Modem to refuse it.

The three-letter instruction code is indicated also to assist decoding the following problem parameters:

- ***For the CDM-600L modem***, the code is the hex value of the position of the problem parameter within the MGC configuration code.

00		NO ERROR	01	TFQ	Tx Frequency
09	TDR	Tx Data Rate	12	TFT	Tx FEC Type
13	TRS	Tx Reed Solomon type	14	TCR	Tx FEC Code Rate
15	TMD	Tx Modulation	16	TSI	Tx Spectrum Inversion
17	TSC	Tx Scrambler state	18	TPL	Tx Power Level
1C	AUP	AUPC enable	1D	APP	AUPC parameters
23	TCK	Tx Clock source	24	TXO	Tx Carrier state
25	TIT	Tx Interface Type	26	TTC	Tx Ternary Code
27	TFM	Tx Framing Mode	28	TIP	Tx IF Impedance
29	RFQ	Rx Frequency	31	RDR	Rx Data Rate
3A	RFT	Rx FEC Type	3B	RRS	Rx Reed Solomon type
3C	RCR	Rx FEC Code Rate	3D	RMD	Rx Modulation
3E	RSI	Rx Spectrum Inversion	3F	RDS	Rx DeScrambler state
40	RSW	Rx Sweep Width	42	RCK	Rx Clock source
43	EBA	EbNo Alarm point	47	RBS	Rx Buffer Size
4C	RIT	Rx Interface Type	4D	RTC	Rx Ternary Code
4E	RFM	Rx Framing Mode	4F	RIP	Rx IF Impedance
50	EFM	Unit EDMAC Mode	51	ESA	EDMAC Slave Address
55	TST	Unit Test Mode	56	MSK	Unit Alarm Mask
5C	EFR	External Freq Ref	5D	SSI	Statistics Sampling Interval
5E	RTE	Rx Terrestrial Alarm Enable	5F	TTA	Tx Terrestrial Alarm Mask
60	ODU	ODU comms Enable	61	TBA	Tx Backward Alarms
65	RBA	Rx Backward Alarms	69	TVL	Tx audio Volume
6D	RVL	Rx audio Volume	71	DTY	Drop Type
72	ITY	Insert Type	73	TET	Tx ESC Type - 64k or 2 audio
74	RET	Rx ESC Type - 64k or 2 audio	75	ITD	Invert Tx Data
76	IRD	Invert Rx Data			

- ***For the CDM-570L modem***, the code is the decimal number indicating the problem parameter within its MGC configuration code:

00		NO ERROR	01	ITF	Interface
02	LBO	T1 Line Build-Out	03	FRM	Framing mode
04	TFQ	Tx Frequency	05	TFT	Tx FEC Type
06	TMD	Tx Modulation	07	TCR	Tx FEC Code Rate
08	TDR	Tx Data Rate	09	TSI	Tx Spectrum Invert
10	TSC	Tx Scrambler state	11	TPL	Tx Power Level
12	TCK	Tx Clock	13	TDI	Tx Data Invert
14	TXO	Tx Carrier State	15	AUP	AUPC enable
16	APP	AUPC parameters	17	WUD	Warm-Up Delay
18	RFQ	Rx Frequency	19	RFT	Rx FEC Type
20	RMD	Rx Modulation	21	RCR	Rx FEC Code Rate
22	RDR	Rx Data Rate	23	RSI	Rx Spectrum Invert
24	RDS	Rx DeScrambler state	25	RDI	Rx Data Invert
26	RSW	Rx Sweep Width	27	EBA	Eb/No Alarm point
28	RBS	Rx Buffer Size/enable	29	ERF	External Reference setting
30	EFM	EDMAC Framing mode	31	ESA	EDMAC Slave Address range
32	TST	Test mode	33	MSK	Alarm Masks
34	RTS	Request-To-Send control	35	SSI	Statistics Sample Interval

► ***For the CDM-Qx modem***, the code is the decimal number indicating the problem parameter within its MGC configuration code:

00		NO ERROR	01	ITF	Interface
02	LBO	T1 Line Build-Out	03	FRM	Framing mode
04	TFQ	Tx Frequency	05	TFT	Tx FEC Type
06	TMD	Tx Modulation	07	TCR	Tx FEC Code Rate
08	TDR	Tx Data Rate	09	TSI	Tx Spectrum Invert
10	TSC	Tx Scrambler state	11	TPL	Tx Power Level
12	TCK	Tx Clock	13	TDI	Tx Data Invert
14	TXO	Tx Carrier State	15	AUP	AUPC enable
16	APP	AUPC parameters	17	WUD	Warm-Up Delay
18	TXC	Tx common output state	19	TRS	Tx Reed-Solomon
20	TXA	Tx roll-off (alpha) factor	21	TCI	Tx Data Clock Invert
22	RFQ	Rx Frequency	23	RFT	Rx FEC Type
24	RMD	Rx Modulation	25	RCR	Rx FEC Code Rate
26	RDR	Rx Data Rate	27	RSI	Rx Spectrum Invert
28	RDS	Rx DeScrambler state	29	RDI	Rx Data Invert
30	RSW	Rx Sweep Width	31	EBA	Eb/No Alarm point
32	BCS	Rx Buffer clock source	33	RRS	Rx Reed-Solomon
34	RBS	Rx Buffer size/enable	35	RCI	Rx Data Clock Invert
36	ERF	External Reference setting	37	EFM	EDMAC Framing mode
38	ESA	EDMAC Slave Address range	39	TST	Test mode (read-only)
40	MSK	Alarm Masks	41	RTS	Request-To-Send control
42	SSI	Statistics Sample Interval	43	CNM	CnC Mode
44	CFO	CnC Frequency Offset	45	CSD	CnC Min/Max Search Delay
46	CRA	CnC Re-acquisition Time			

```
SWITCH ALARM: MODEM COMMS
     PROBLEM, POSITION  2
```

There is a fault. There is a problem with the I/O communications with Traffic Modem. The front panel LED "Unit Status" will be **RED**.

Suggestions:

- Check Cable Connections – refer to **Chapter 4. CABLES AND CONNECTIONS.**
- Check Modem Configurations – refer **to Chapter 5. MODEM, RMI/TMI, AND SWITCH CONFIGURATION.**

```
SWITCH ALARM:   TMI:I/F
   MISMATCH, POSITION 2
```

There is a fault. There is a mismatch of data interface type between what has been selected in the modem menu and the TMI type that is connected to that Traffic Modem. The front panel LED "Unit Status" will be **RED**.

Suggestion: Ensure the modem interface type is compatible with the TMI being used. The CDM-600s have both TX and RX interface types. The CDM-570s just have one unit interface type. Either edit the modem interface setting(s) or swap the TMI.

7.6.3 MONITOR: STORED-EVENTS

```
STORED EVENTS: VIEW
CLEAR-ALL (PRESS ENTER)
```

The User may select **VIEW** or **CLEAR-ALL**, using the ◄ ► arrow keys, then press **[ENT]**.

If the User selects **CLEAR-ALL**, the event log is cleared and the User is taken directly back to the previous menu. However, if there are faults present on the unit at this time, new log entries will be generated for those faults.

Note that the date is shown in **DAY/MONTH/YEAR** format, in accordance with international convention.

7.6.3.1 MONITOR: STORED-EVENTS → VIEW

```
LOG23: 26/01/00 10:37:32
FT-06 RX ALARM (UP/DN)
```

The User may scroll backwards or forwards through the entries in the event log, using the ▲ ▼ arrow keys. The event log can store up to 98 events. Press **[ENT]** or **[CLR]** to return to the previous menu.

When a fault (FT) condition occurs, it is time-stamped and put into the log. Similarly, when the fault condition clears (OK), this is also recorded, as shown below:

```
LOG24: 26/01/04 10:37:35
OK-06  RX ALARM  (UP/DN)
```

Next to the FT/OK indicator is a number/code for the faulted unit: the TM slot number (1 through 10), RM (for Redundant Modem) or SW (for the Switch).

7.6.4 MONITOR: COMMS (Communications State)

```
GOOD COMMS WITH MODEMS:
  1 2 3 - 5 - 7 8 – 10
```

This display shows that the Switch has good monitoring I/O communications with the indicated modems.

7.6.5 MONITOR: IO

```
<0100/LRS?
>0100/LRS=1
```

This display shows actual communication strings between the Switch and the modems:

Upper line = Switch controller's outbound messages

Lower line = Modem's inbound responses

When in this mode, the communication is slowed down to enable viewing of messages. Because of this, it should only be used for troubleshooting purposes.

7.7 SELECT: STORE/LD (Store or Load Configuration)

```
STORE/LOAD CONFIG:
STORE  LOAD  (PRESS ENTER)
```

Select **STORE** or **LOAD** using the ◄ ► arrow keys, then to press **[ENT]**. These submenus permit the User to store or load up to 10 different Switch configurations in its non-volatile memory.

NOTE: These are configurations for the Switch itself, not the modems to which it is attached.

7.7.1 STORE/LD: STORE

```
STORE CONFIGURATION TO
   LOCATION: 10   (ENTER)
```

Select the location, using the ▲ ▼ arrow keys, to where the current configuration is to be stored, then press **[ENT]**. Locations 1 through 10 are available. If the selected location does not contain a previously stored configuration, the following display appears:

```
YOUR CONFIGURATION HAS
BEEN STORED!    (ENTER)
```

Press **[ENT]** or **[CLR]** to return to the previous menu. If, however, the selected location contains a previously stored configuration, the following display appears:

```
WARNING!  LOC 10 CONTAINS
DATA!  OVERWRITE?  NO  YES
```

Select **NO** or **YES** using the ◄ ► arrow keys, then to press **[ENT]**. Selecting **YES** will overwrite the existing configuration at the selected location.

7.7.2 STORE/LD: LOAD

```
LOAD CONFIGURATION FROM
   LOCATION: 10  (ENTER)
```

Select the location to load a configuration from, using the ▲ ▼ arrow keys, then to press **[ENT]**. Locations 1 through 10 are available. If the selected location contains valid data, the following display appears:

```
 THE NEW CONFIGURATION
HAS BEEN LOADED  (ENTER)
```

Press **[ENT]** or **[CLR]** to return to the previous menu. If, however, the selected location does not contain valid data, the following screen display appears:

```
WARNING! LOC 10 CONTAINS
NO DATA!         (ENTER)
```

Press **[ENT]** or **[CLR]** to return to the previous menu.

7.8 SELECT: UTILITY

```
UTILITY: SET-RTC   DISPLAY
SWITCH-ID  TEST  RELAY (ENT)
```

Select **SET-RTC**, **DISPLAY**, **SWITCH-ID**, or **TEST RELA**Y using the ◄ ► arrow keys, then press **[ENT]**. This submenu permits the User to select from a number of different utility functions, which are described as follows:

7.8.1 UTILITY: SET- RTC (Set Real-Time Clock)

```
EDIT REAL TIME CLOCK:
12:00:00  24/04/00  (ENT)
```

Edit the time and date settings of the real-time clock. Select the character to be edited using the ◄ ► arrow keys, then change the value of the digit using the ▲ ▼ arrow keys.

Note that in accordance with international convention, the date is shown in D**AY/MONTH/YEAR** format.

Once the time and date has been edited, the User should press **[ENT]**.

7.8.2 UTILITY: DISPLAY (Display Brightness)

```
EDIT DISPLAY BRIGHTNESS:
100%       (PRESS ENTER)
```

Brightness levels of 25%, 50%, 75% or 100% are selectable. Edit the display brightness using the ▲▼ arrow keys. Once the desired brightness has been set, press **[ENT]**.

7.8.3 UTILITY: SWITCH-ID

```
EDIT SWITCH ID:   (ENTER)
---- THIS IS A TEST ----
```

Edit the Switch ID string. Only the bottom line (24 characters) is available. Edit the string by selecting the cursor position on the bottom line using the ◄ ► arrow keys, then editing the character in that position using the ▲▼ arrow keys.

The following characters are available:

[space] ( ) * + - , . / 0-9 *and* A-Z

Once the Switch ID string has been edited, press **[ENT]**.

7.8.4 UTILITY: TEST

This is an excellent method to test the whole system before setting the Switch for automatic mode.

The Switch suspends normal system polling and initiates a test:

```
CONFIG TESTING……2
TM#:        1 OK
```

```
 TEST COMPLETE.
 CHECK 2.
```

The total configuration of each activated modem is configured into the Redundant Modem in sequence. If any configuration is not accepted, a fault will be shown on the display.

Press **[CLR]** to return to the top-level (main) menu.

7.8.5 UTILITY: RELAY

```
POWER-OFF RELAY LOGIC:
DEFAULT  INVERT   (ENT)
```

Because the phrasing of the alarm relay “Normally Open” and “Normally Closed” conditions is easily misinterpreted, to facilitate customer connection to existing external equipment, the logic of the external relay condition may be inverted.

Select **DEFAULT** or **INVERT** using the ◄ ► arrow keys, then press **[ENT]**.

Notes:

Appendix A. CABLE DRAWINGS

A.1 Introduction

This appendix contains drawings of cables used with the CRS-300. These cables are divided into three categories: User / Utility Cables, Control Cables, and Control / IF / Data Cables. Each section includes illustrations of the cables' technical specifications; additionally, the tables provided in **Sections A.3** and **A.4** cross-reference cabling illustrations included in **Chapter 4. CABLES AND CONNECTIONS**.

A.2 User/Utility Cables

App. A FIG	CEFD P/N	DESCRIPTION	USED WITH CRS-300 → ...	USED FOR (DATA TYPE)
A-1	N/A	DB-25M → DB-37F	User data	EIA-530 → EIA-422/449 DCE Conversion
A-2	N/A	DB-25M → 34-pin Winchester (Female)	User data	EIA-530 → V.35 DCE Conversion
A-3	N/A	DB-9M → DB-9F	User EIA-232 Switch Programming / Flash Upgrade	CRS-300 Remote → PC Serial Port

A.2.1 EIA-530 to EIA-422 Data Cable

Figure A-1 shows the cable drawing for EIA-530 to EIA-422/449 DCE conversion for connections between the Switch and the User data.

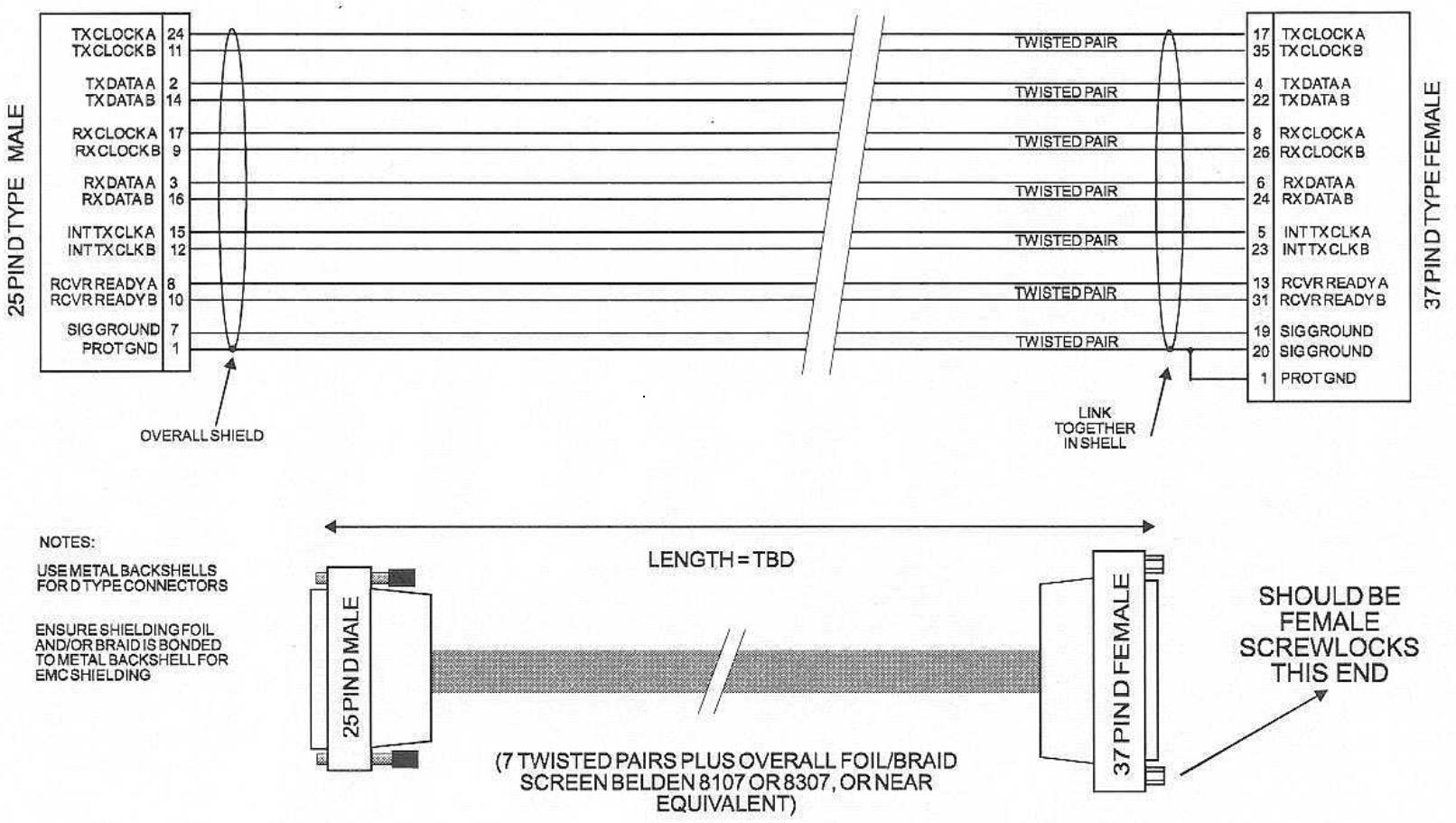

25 PIN D TYPE MALE
TX CLOCK A 24
TX CLOCK B 11
TX DATA A 2
TX DATA B 14
RX CLOCK A 17
RX CLOCK B 9
RX DATA A 3
RX DATA B 16
INT TX CLK A 15
INT TX CLK B 12
RCVR READY A 8
RCVR READY B 10
SIG GROUND 7
PROT GND 1
OVERALL SHIELD
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
LINK TOGETHER IN SHELL
17 TX CLOCK A
35 TX CLOCK B
4 TX DATA A
22 TX DATA B
8 RX CLOCK A
26 RX CLOCK B
6 RX DATA A
24 RX DATA B
5 INT TX CLK A
23 INT TX CLK B
13 RCVR READY A
31 RCVR READY B
19 SIG GROUND
20 SIG GROUND
1 PROT GND
37 PIN D TYPE FEMALE
NOTES:
USE METAL BACKSHELLS FOR D TYPE CONNECTORS
ENSURE SHIELDING FOIL AND/OR BRAID IS BONDED TO METAL BACKSHELL FOR EMC SHIELDING
LENGTH = TBD
25 PIN D MALE
37 PIN D FEMALE
SHOULD BE FEMALE SCREWLOCKS THIS END
(7 TWISTED PAIRS PLUS OVERALL FOIL/BRAID SCREEN BELDEN 8107 OR 8307, OR NEAR EQUIVALENT)

Figure A-1. DCE Conversion Cable: EIA-530 to EIA-422/449

A.2.2 EIA-530 to V.35 Data Cable

Figure A-2 shows the cable drawing for EIA-530 to V.35 DCE conversion for connections between the Switch and the User data.

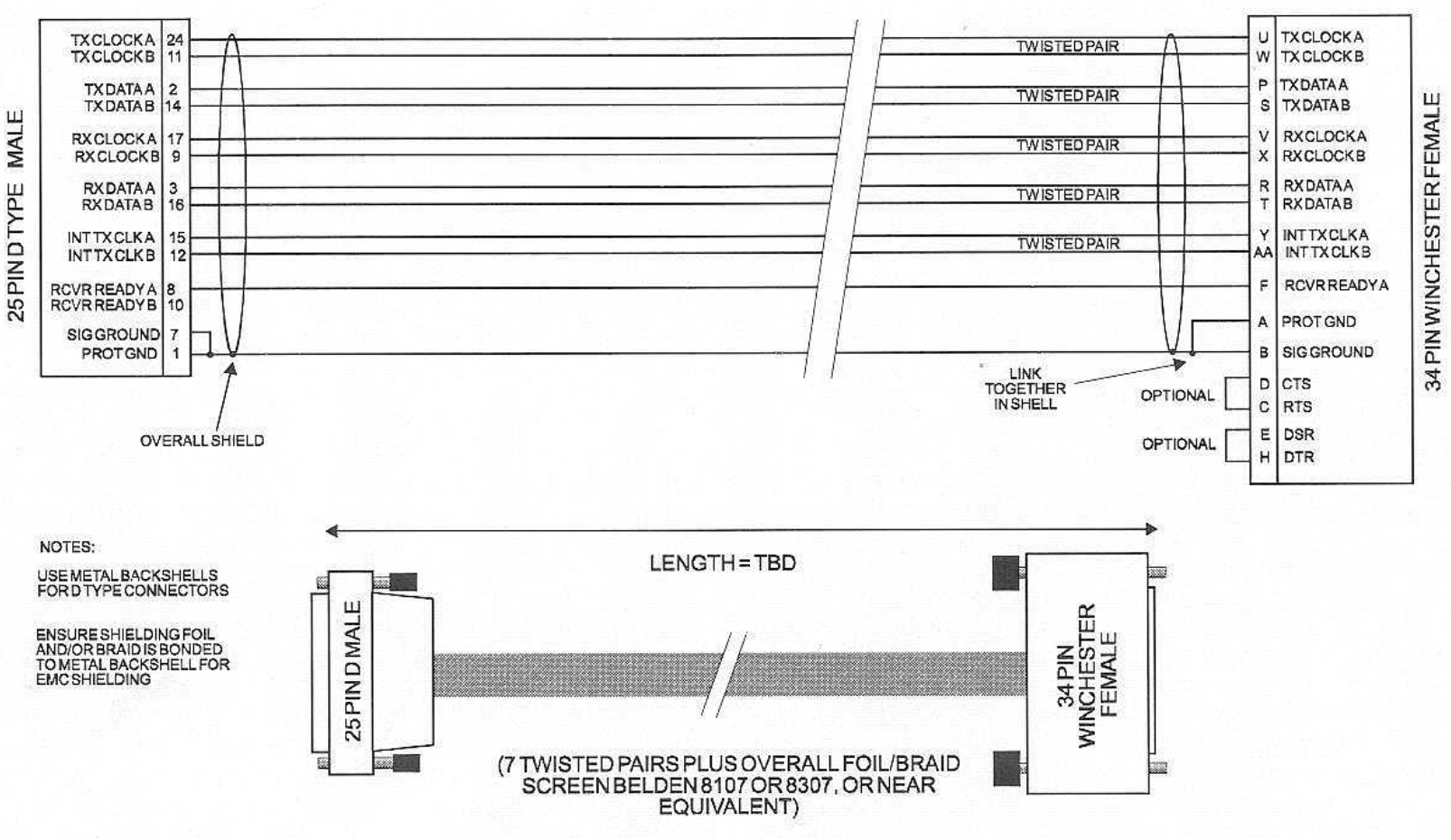


Figure A-2. DCE Conversion Cable: EIA-530 to V.35

A.2.3 Switch Programming Cable

Figure A-3 shows the cable required for a simple EIA-232 connection between the CRS-300 remote control port and a PC serial port. This cable is needed for Flash upgrading.

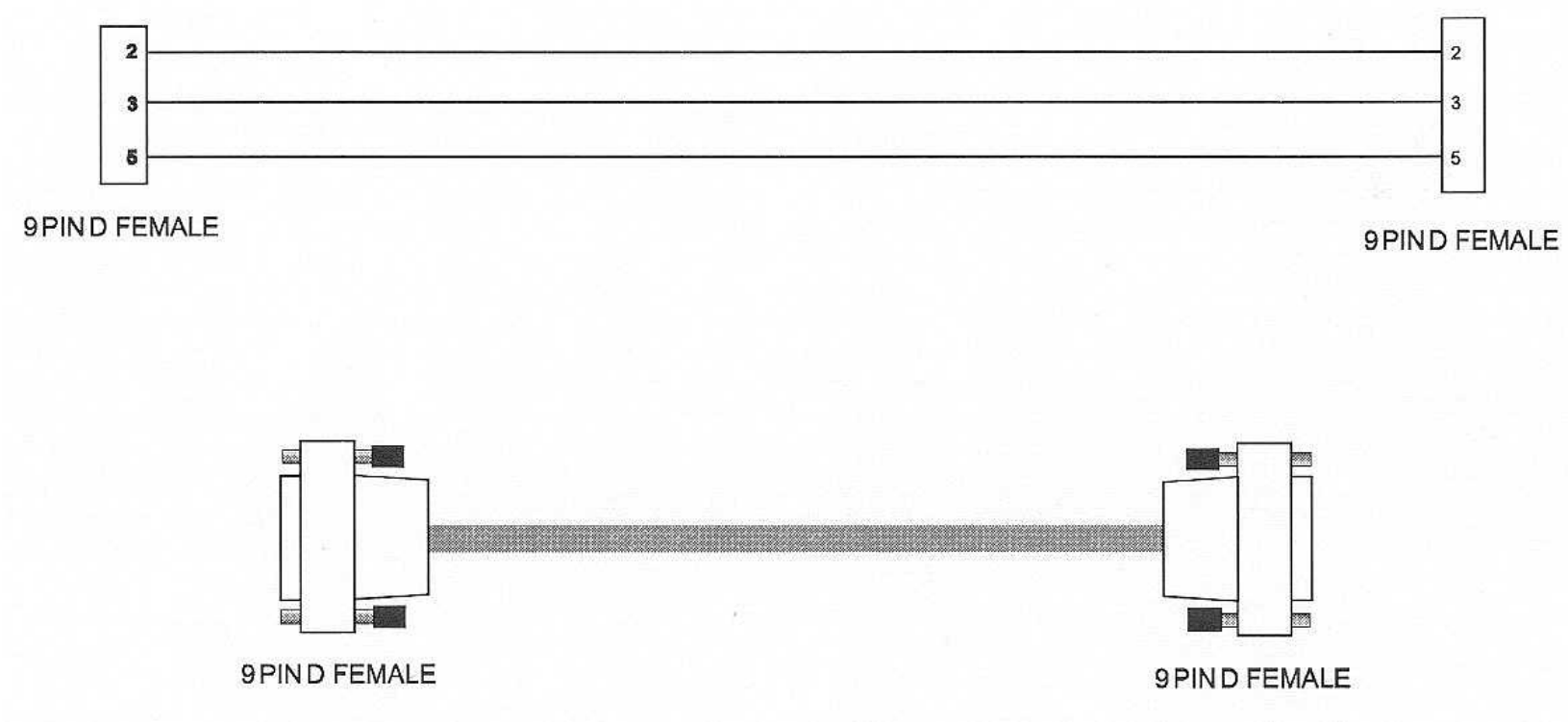


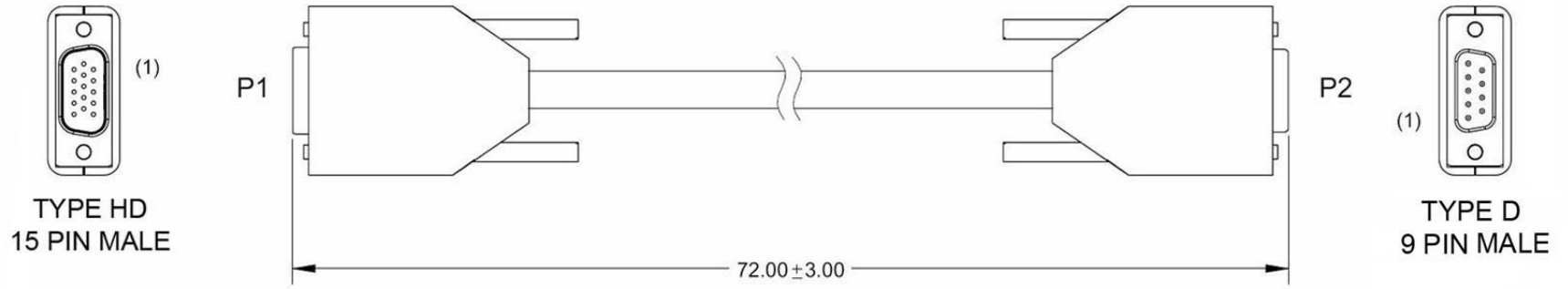
Figure A-3. Switch Programming Cable

A.3 Control Cables

App. A FIG	CEFD P/N	DESCRIPTION	USED WITH CRS-300 →	REF Ch. 4 FIG	USED FOR (TYPE)
A-4	CA-0000069	HD-15M → DB-9M, 6’	CDM-625	4-10	Control
				4-11	
				4-12	
				4-13	
A-5	CA/WR11417-1	(15X) DB-9F SHIELDED	CDM-Qx / QxL	4-16	EIA-485 Multi-drop (standard)
A-6	CA/WR11418-1	Terminal		4-16	Terminal
A-7	CA/WR11419-1	DB-9M → DB-9M, 6”		4-16	Null Modem
A-8	CA/RB11423-1	(15X) DB-9F RIBBON		4-16	EIA-485 Multi-drop (optional)
A-9	CA/WR12069-1	HD-15M → (2X) DB-15F, 6’	CDM-Qx / QxL	4-17	Control ‘Y’
				4-18	
				4-19	
				4-20	
				4-21	
A-10	CA/WR12361-1	DB-15F → HD-15M, 6’	CDM-700	4-22	Control
				4-23	
				4-24	
				4-25	
				4-26	
				4-27	
			CDM-710	4-28	
				4-29	
			CDM-710G	4-30	
				4-31	
A-11	CA/WR12136-1	HD-15M → HD-15M, 4’	SLM-5650/5650A	4-32	Control
				4-33	
				4-34	
A-12	CA/WR12842-6	HD-15M → DB-9M, HD-15M, 6’	TMI/RMI → SLM-5650/5650A SLM-5650/5650A AGC, I&Q → User	N/A	Control ‘Y’

A.3.1 Control Cable for CDM-625

Figure A-4 shows the control cable that connects the CDM-625 to the CRS-300.

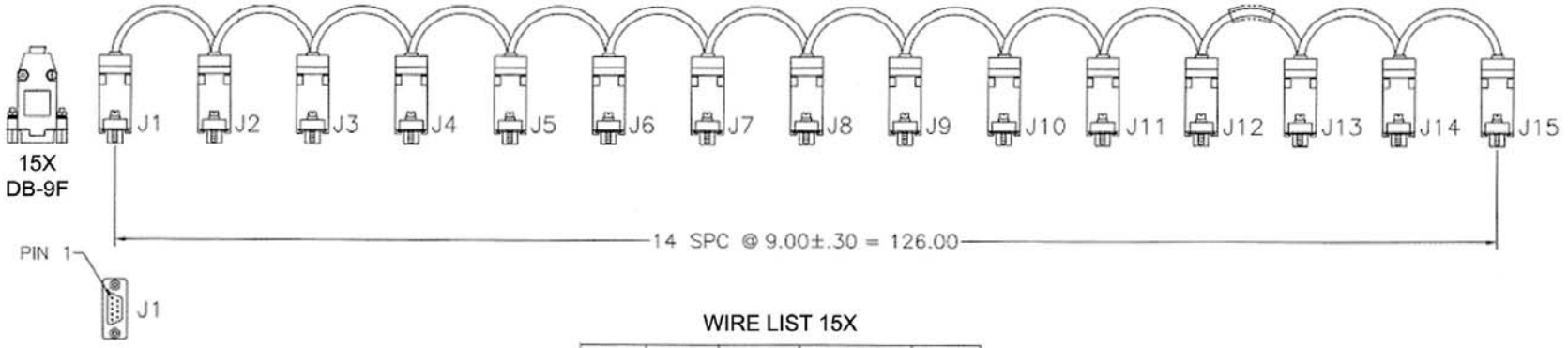


WIRE LIST		
FROM	TO	COMMENTS
P1-1	N/C	-
P1-2	N/C	-
P1-3	N/C	-
P1-4	P2-4	-
P1-5	P2-1	SHIELD, ITEM 8
P1-6	N/C	-
P1-7	N/C	-
P1-8	N/C	-
P1-9	P2-9	-
P1-10	P2-3	-
P1-11	P2-2	-
P1-12	P2-6	-
P1-13	P2-8	-
P1-14	P2-7	-
P1-15	P2-5	-

Figure A-4. CDM-625 Control Cable (CA-0000069)

A.3.2 Standard EIA-485 Multi-drop Shielded Cable, (15X) DB-9 Female

Figure A-5 shows the standard EIA-485 Multi-drop Shielded Cable. This cable is required to daisy-chain the CDM-Qx / QxL modems and Switch together for communications. If Electromagnetic Compatibility (EMC) is not a concern, then use the optional EIA-485 Multi-drop Ribbon Cable.



WIRE LIST 15X

FROM	TO	SIGNAL	COLOR	PAIR
J1–1	J2–1	GND	DRAIN	
J1–2	J2–2	RXD	RED	X
J1–3	J2–3	TXD	BLK	
J1–4	J2–4	+TX1	BLU	X
J1–5	J2–5	–TX1	BLK	
J1–8	J2–8	+RX1	WHT	X
J1–9	J2–9	–RX1	BLK	
J1–6	J2–6	+RX2	GRN	X
J1–7	J2–7	–RX2	BLK	

Figure A-5. Standard EIA-485 Multi-Drop Shielded Cable (CA/WR11417-1)

A.3.3 EIA-485 Cable Termination, (15X) DB-9 Male

Figure A-6 shows the EIA-485 Cable Termination required for terminating the ends of the EIA-485 Multi-Drop Ribbon Cable (CA/RB11423-1) or EIA-485 Multi-Drop Shielded Cable (CA/WR11417-1).

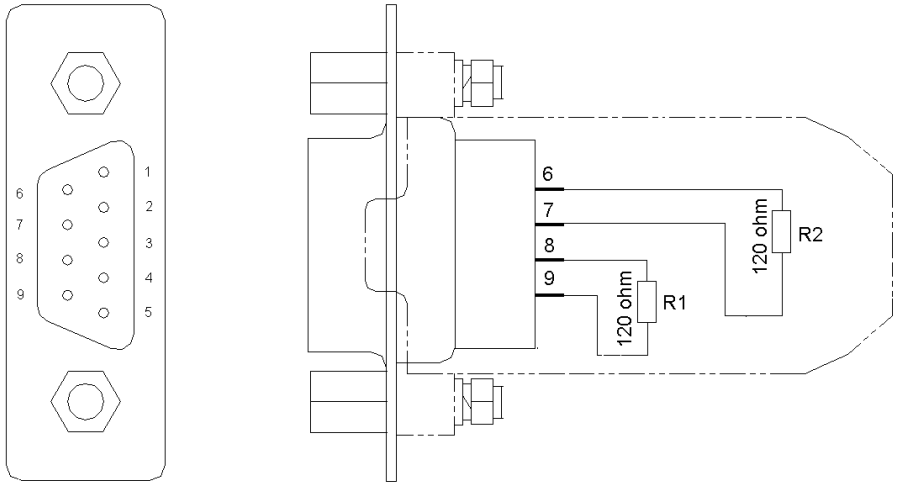


Figure A-6. EIA-485 Cable Termination (CA/WR11418-1)

A.3.4 EIA-485 Null Modem Cable, DB-9 Male

Figure A-7 shows the EIA-485 Null Modem Cable required for the EIA-485 multi-drop for the CDM-Qx / QxL modems. This attaches to the DB-9F "485 Pass-through" connector on the CRS-230 controller module.

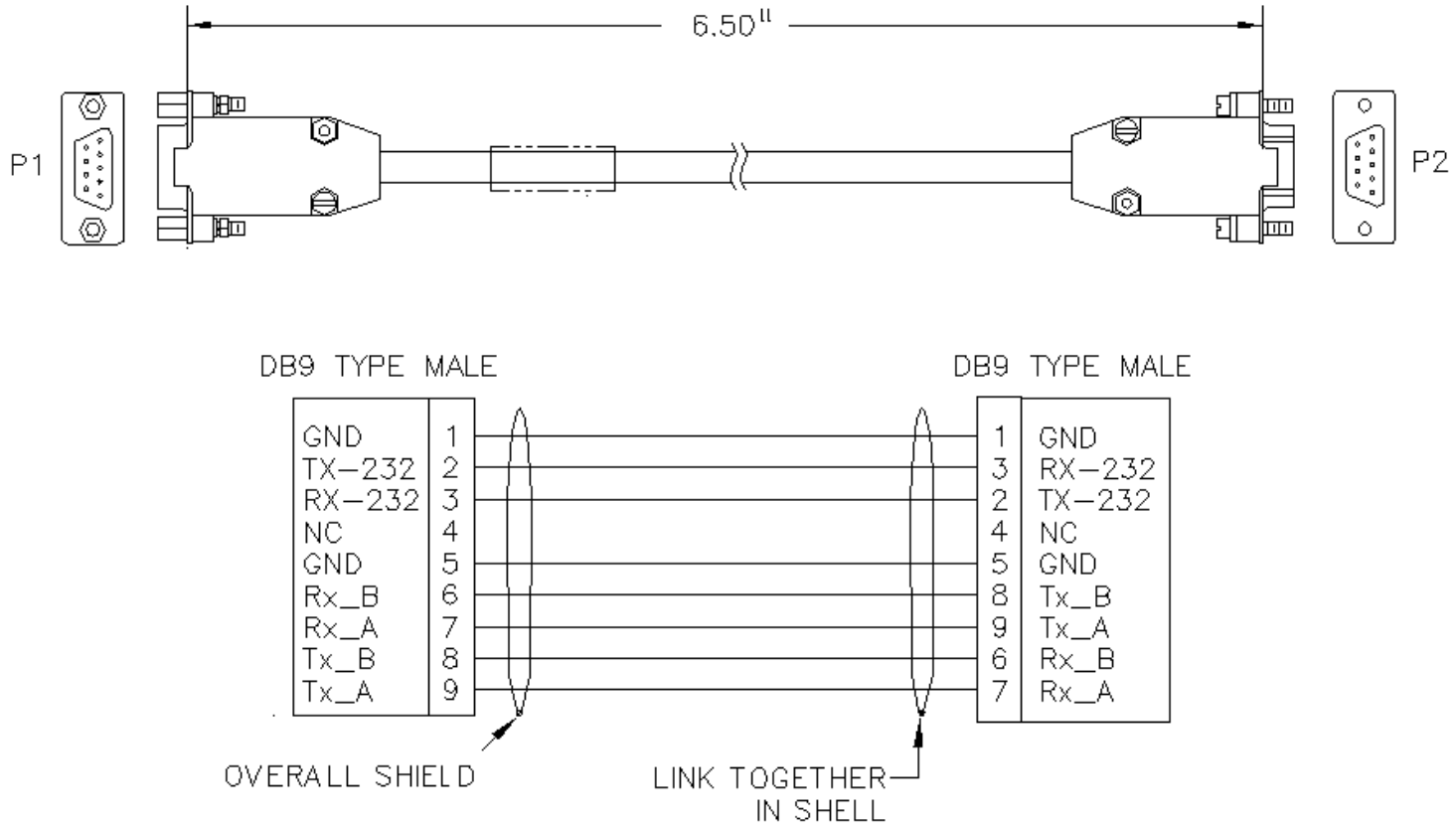


Figure A-7. EIA-485 Null Modem Cable (CA/WR11419-1)

A.3.5 Optional EIA-485 Multi-drop Ribbon Cable, (15X) DB-9 Female

Figure A-8 shows the optional EIA-485 Multi-drop Ribbon Cable. This cable is required to daisy-chain the CDM-Qx / QxL modems and Switch together for communications. If Electromagnetic Compatibility (EMC) is a concern, then use the standard EIA-485 Multi-Drop Shielded Cable.

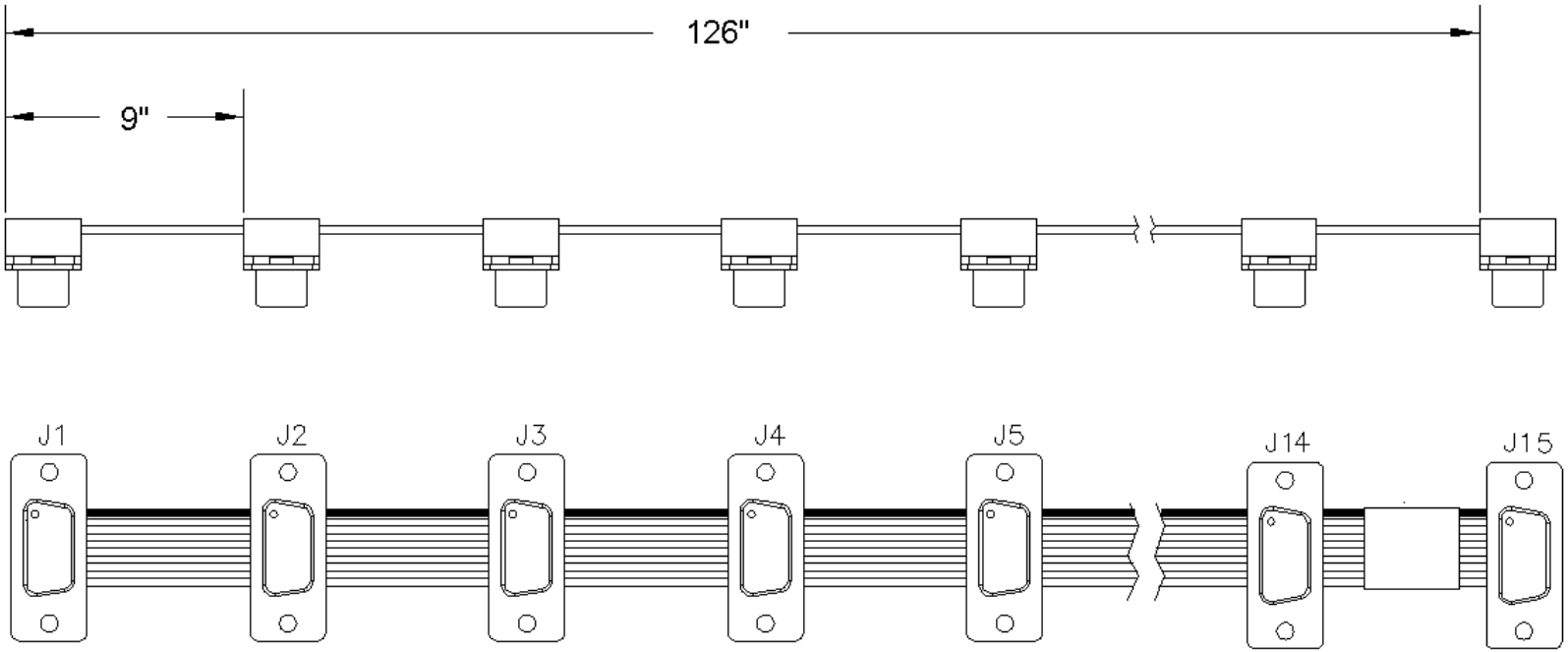
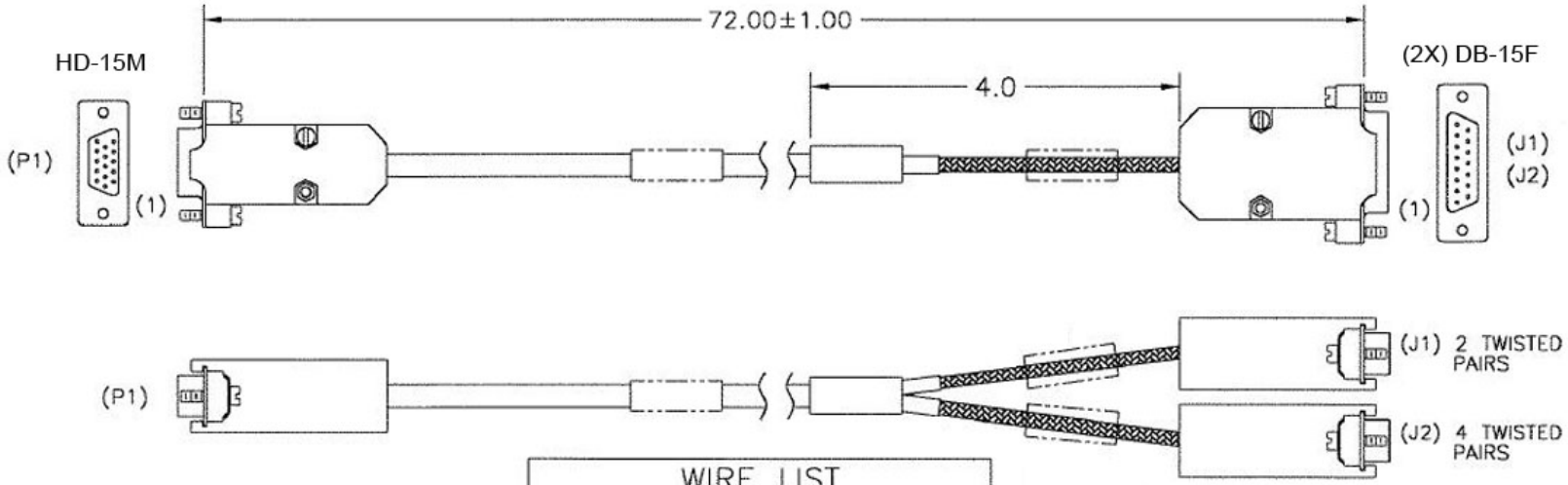


Figure A-8. Optional EIA-485 Multi-Drop Ribbon Cable (CA/RB11423-1)

A.3.6 Control 'Y' Cable for CDM-Qx and CDM-QxL with CnC®

Figure A-9 shows one of the two types of control cables required for the CDM-Qx / QxL modems. This cable adapts from both mod and demod DB-15 Alarm connectors on the modem to the HD-15 "Fault" connector on the Switch TMI/RMI. These interfaces are capable of CnC® support.



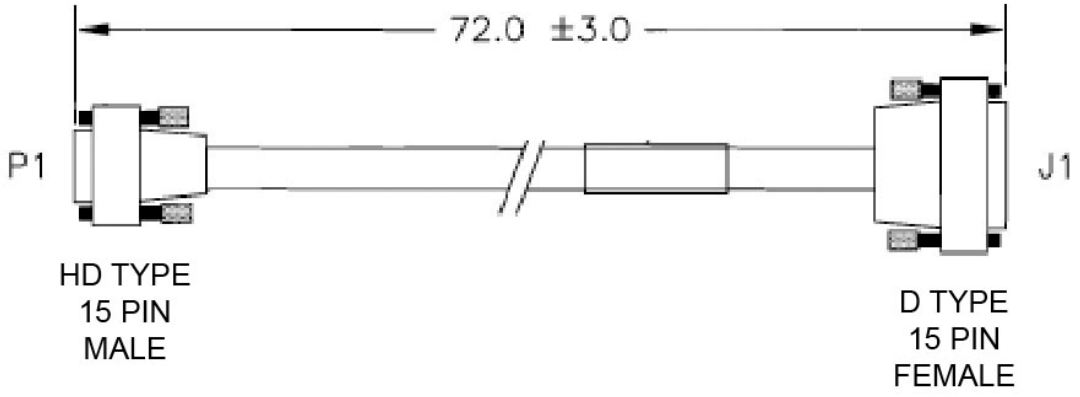
WIRE LIST

	FROM	TO	SIGNAL	PAIR
2 TWISTED PAIRS	P1-3	J1-11	PAIR1_A	X
	P1-5	J1-1	PAIR1_B	
	P1-8	J1-3	PAIR2_A	X
	P1-5	J1-1	PAIR2_B	
4 TWISTED PAIRS	P1-2	J2-11	PAIR3_A	X
	P1-5	J2-4	PAIR3_B	
	P1-7	J2-3	PAIR4_A	X
	P1-5	J2-4	PAIR4_B	
	P1-4	J2-12	PAIR5_A	X
	P1-14	J2-15	PAIR5_B	
	P1-13	J2-6	PAIR6_A	X
	P1-10	J2-9	PAIR6_B	
	J2-4	J2-7	JUMPER	
	J2-7	J2-13	JUMPER	
	J2-13	J2-1	JUMPER	

Figure A-9. Control 'Y' Cable for CDM-QxL with CnC® (CA/WR12069-1)

A.3.7 Control Cable for CDM-700, CDM-710

Figure A-10 shows the control cable that connects the CDM-700 and CDM-710 modems to the CRS-300.

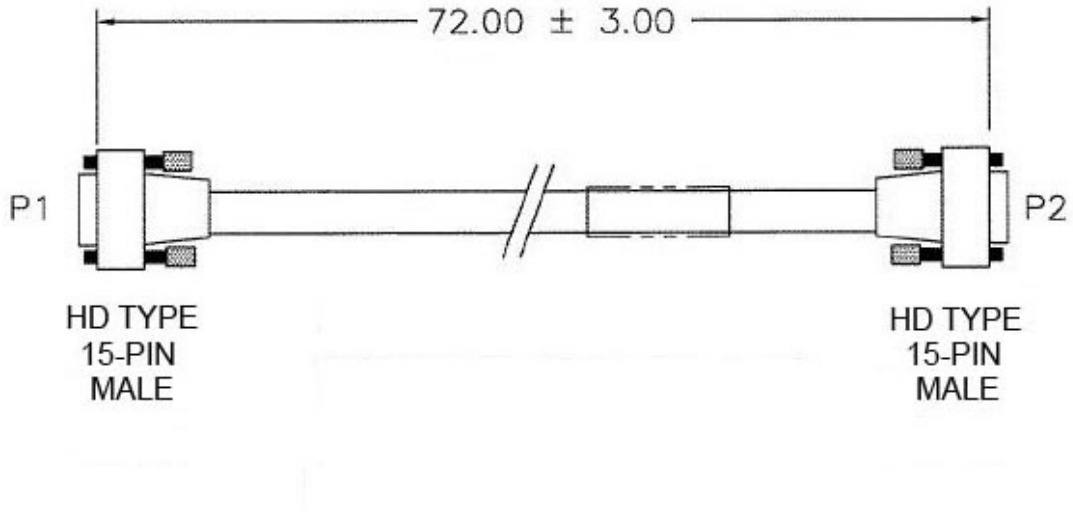


WIRE LIST	
FROM	TO
P1–4	J1–4
P1–5	J1–1
P1–9	J1–12
P1–10	J1–9
P1–11	J1–10
P1–12	J1–2
P1–13	J1–3
P1–14	J1–11
P1–15	J1–6

Figure A-10. CDM-7x0 Control Cable (CA/WR12361-1)

A.3.8 Control Cable for SLM-5650/5650A

Figure A-11 shows the control cable that connects the SLM-5650/5650A to the CRS-300.

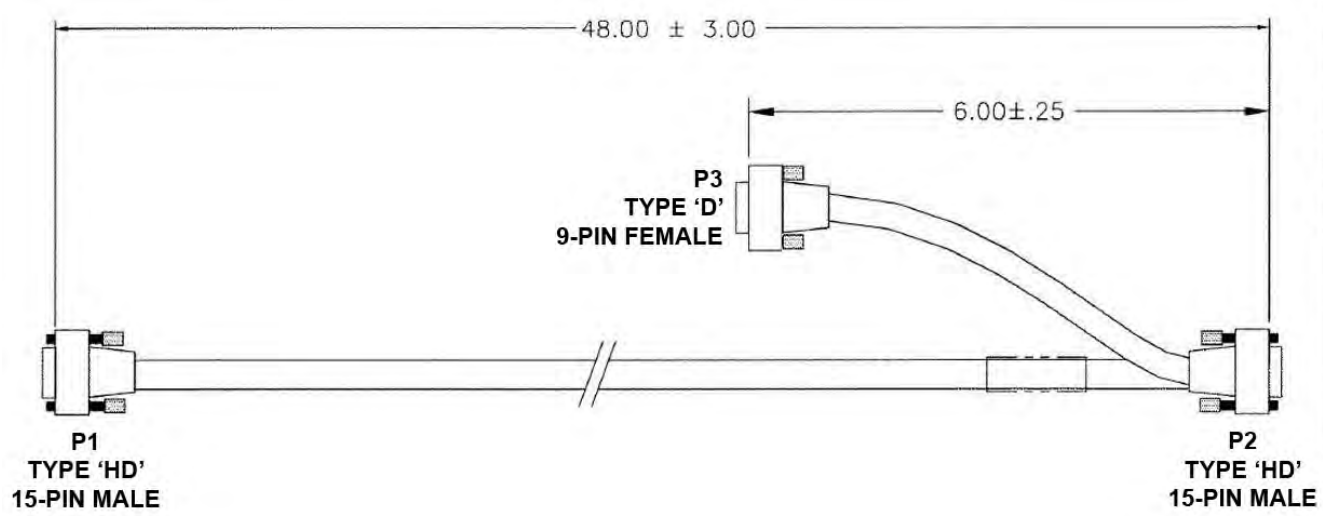


WIRE LIST		
FROM	TO	TWISTED PAIR
P1–1 P1–6	P2–1 P2–6	X
P1–2 P1–7	P2–2 P2–7	X
P1–3 P1–8	P2–3 P2–8	X
P1–4 P1–5 P1–9 P1–10 P1–11 P1–12 P1–13 P1–14 P1–15	P2–4 P2–5 P2–9 P2–10 P2–11 P2–12 P2–13 P2–14 P2–15	

Figure A-11. SLM-5650/5650A Control Cable (CA/WR12136-1)

A.3.9 Control 'Y' Cable for SLM-5650/5650A to CRS-300

Figure A-12 shows the Control 'Y' Cable that connects the SLM-5650/5650A to the CRS-300 RMI/TMI. This is an optional cable, purchased separately, used in place of the CA/WR12136-1 cable (see Figure A-11) to give the User access to the AGC and I&Q outputs of the modem.



WIRE LIST		
FROM	TO	TWISTED PAIR
P1–1 P1–6	P2–1/P3–8 P2–6/P3–3	X
P1–2 P1–7	P2–2 P2–7/P3–1	X
P1–3 P1–8	P2–3 P2–8	X
P1–4 P1–5 P1–9 P1–10 P1–11 P1–12 P1–13 P1–14 P1–15	P2–4 P2–5/P3–5 P2–9 P2–10 P2–11 P2–12 P2–13 P2–14 P2–15	

DB-9 (P3) User Access Pinout	
Pin Number	Signal Name
1	AGC Monitor
3	DeMod Q
5	Ground
8	DeMod I

Figure A-12. SLM-5650/5650A Control 'Y' Cable (CA/WR12842-6)

A.4 Control / IF / Data Cables & Accessories

App. A FIG	CEFD P/N	DESCRIPTION	USED WITH CRS-300 → ...	Chp. 4 FIG	USED FOR (TYPE)
A-13	CA/WR0066	DB-25F → DB-25M, 6'	CRS-280	4-1	Control
			CRS-280L	4-2	
			CRS-350	4-3	
			CRS-350 → CRS-280	4-4	
			CRS-350 → CRS-280L	4-5	
			CDM-570/570L	4-6	Control / EIA-422 Data
			CDM-600/600L	4-7	
			CDM-600/600L → CRS-350	4-8	Control
			CDM-625	4-10	Control/Data
				4-11	
				4-12	
				4-13	
			CDM-Qx / QxL	4-17	RS422 Data
			SLM-5650/5650A	4-32	RS422 Data, EIA530/RS232
			SLM-5650/5650A → CRS-350	4-35	ESC Data
A-14	CA/WR11999-6	DB15F → DB-15M, 6'	CDM-570/570L	4-6	Bal G.703 Data
A-15	CA/WR9038-6	DB-15F → DB-15M, 6'	CDM-600/600L	4-7	Bal G.703 Data
			CDM-600/600L → CRS-350	4-8	IDR Data
			CDM-625 (CDM-600/600L Emulator Mode)	4-15	Bal G.703 Data
			CDM-Qx / QxL	4-18	
			SLM-5650/5650A	4-33	
A-16	CA/WR9932-1	DB-9F → DB-9M, 6'	CDM-600/600L → CRS-350	4-8	Audio Data
A-17	CA-0000072	DB-15F → DB-9M, 6'	CDM-625	4-10	Bal / Unbal G.703 Data
				4-11	
A-18	CA-0000073	DB-15F → (2X) DB-9M, 6'	CDM-625	4-12	Quad E1 'Y' Data
				4-13	
A-19	PL/0813-8	75Ω BNC → 75Ω BNC, 8'	CDM-625	4-10	ASI Data
				4-11	
				4-12	
				4-13	
			CDM-Qx / QxL	4-18	Unbal G.703 Data
			CDM-710	4-28	ASI Data
			CDM-710G	4-30	G.703 Data
			SLM-5650/5650A	4-33	Unbal G.703 Data
			Modem → CRS-280	4-37	IF

App. A FIG	CEFD P/N	DESCRIPTION	USED WITH CRS-300 → ...	Chp. 4 FIG	USED FOR (TYPE)
A-20	CA-0000074	DB-44M & DB-9M → DB-9M, DB-15M, & DB-25F	CDM-625 → CRS-350	4-14	Overhead Data
A-21	CA/WR9189-6	HD-50M → HD-50M, 6'	CDM-Qx / QxL	4-19	HSSI Data
			CDM-700	4-22	
				4-23	
				4-25	
			CDM-710	4-28	
			CDM-710G	4-30	
			SLM-5650/5650A	4-31	
A-22	CA/WR13018	DB-15F → (4X) RJ-48, 6'	CDM-Qx / QxL	4-20	Quad E1 Data
A-23	PP/CAT5FF7FTGY	RJ-48 → RJ-48, 7'	CDM-625	4-11	10/100 Ethernet
				4-12	
			CDM-Qx / QxL	4-21	Quad E1Data
			CDM-700	4-24	Cat5 Ethernet
				4-25	
				4-26	
				4-27	
			CDM-710	4-29	
			CDM-710G	4-31	
			SLM-5650/5650A	4-32	
A-24	CA/RF12278-1	DB-9F → (8X) BNC, 6'	CDM-700	4-22	G.703 Data
			CDM-710	4-23	
A-25	CA/RF12279-1	DB-15F → (8X) BNC, 6'	CDM-700	4-22	G.703 Data
			CDM-710	4-23	
A-26	PL/0946-2	50Ω BNC → 50Ω BNC, 8'	Modem → CRS-280	4-36	IF
A-27	CA-0000121	HD-50M → RJ-45	CDM-625	4-10	10/100 Ethernet
				4-11	
				4-12	
A-28	CA-0000275	(11X) DB-9M, 8.25'	CDM-625	4-9	Carrier-in-Carrier® (CnC) Plus
A-29	CA-0000136	DB-9M → DB-9F	CDM-625	4-12	Quad E1 Data
				4-13	
A-30	CA-0000163	DB-9M → (2X) DB-15F	CDM-625	N/A	Quad E1 Data
A-31	CA-0000164	DB-9M → (2X) RJ-48	CDM-625	N/A	Quad E1 Data
A-32	CN-0000268	DB-15M → RJ-48	CDM-570/570L, CDM-600/600L	N/A	T1/E1 Data

A.4.1 EIA-232/422, EIA-530 Control and Data Cable, DB-25

Figure A-13 shows the EIA-232/422, EIA-530 data cable for connection between the Switch and Modem or between the Switch and the User data.

INDICATORS		
25M	NOTES	25F
1	TO	1
2	TO	2
3	TO	3
4	TO	4
5	TO	5
6	TO	6
7	TO	7
8	TO	8
9	TO	9
10	TO	10
11	TO	11
12	TO	12
13	TO	13
14	TO	14
15	TO	15
16	TO	16
17	TO	17
18	TO	18
19	TO	19
20	TO	20
21	TO	21
22	TO	22
23	TO	23
24	TO	24
25	TO	25

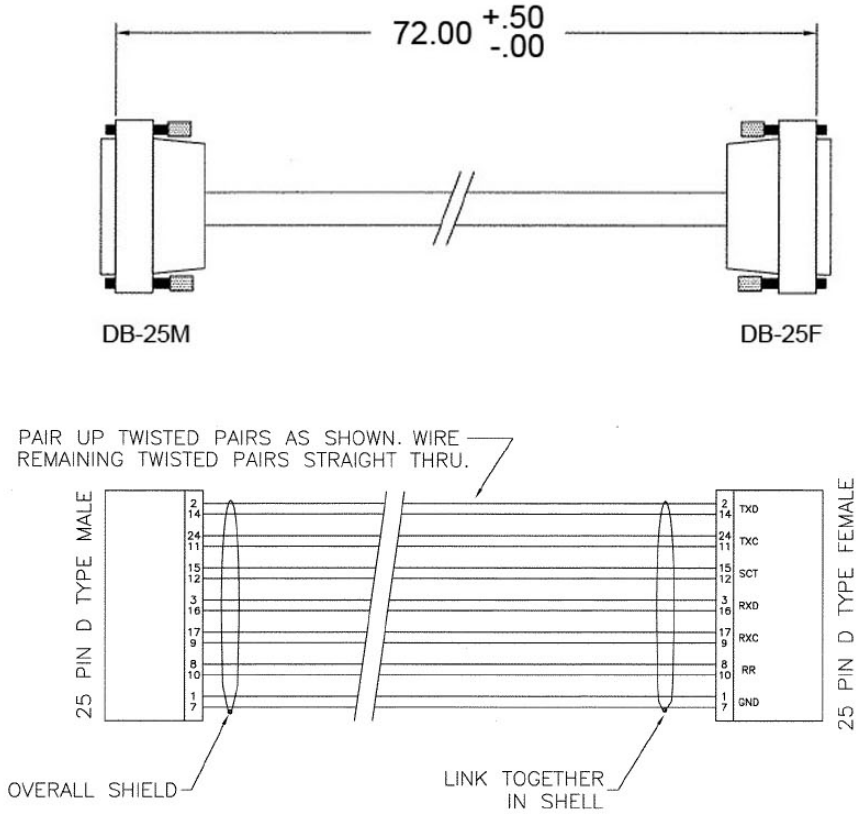


Figure A-13. EIA-232/422, EIA-530 Control and Data Cable (CA/WR0066)

A.4.2 Balanced G.703 Data Cable for CDM-570/570L, DB-15

Figure A-14 shows the DB-15 data cable for connection between the Switch and CDM-570/570L modem or between the Switch and the User data.

INDICATORS		
15M	NOTES	15M
1	TO	9
2	TO	2
3	TO	11
4	TO	4
5	TO	5
6	TO	6
7	TO	7
9	TO	1
11	TO	3
12	TO	12
13	TO	13
15	TO	15

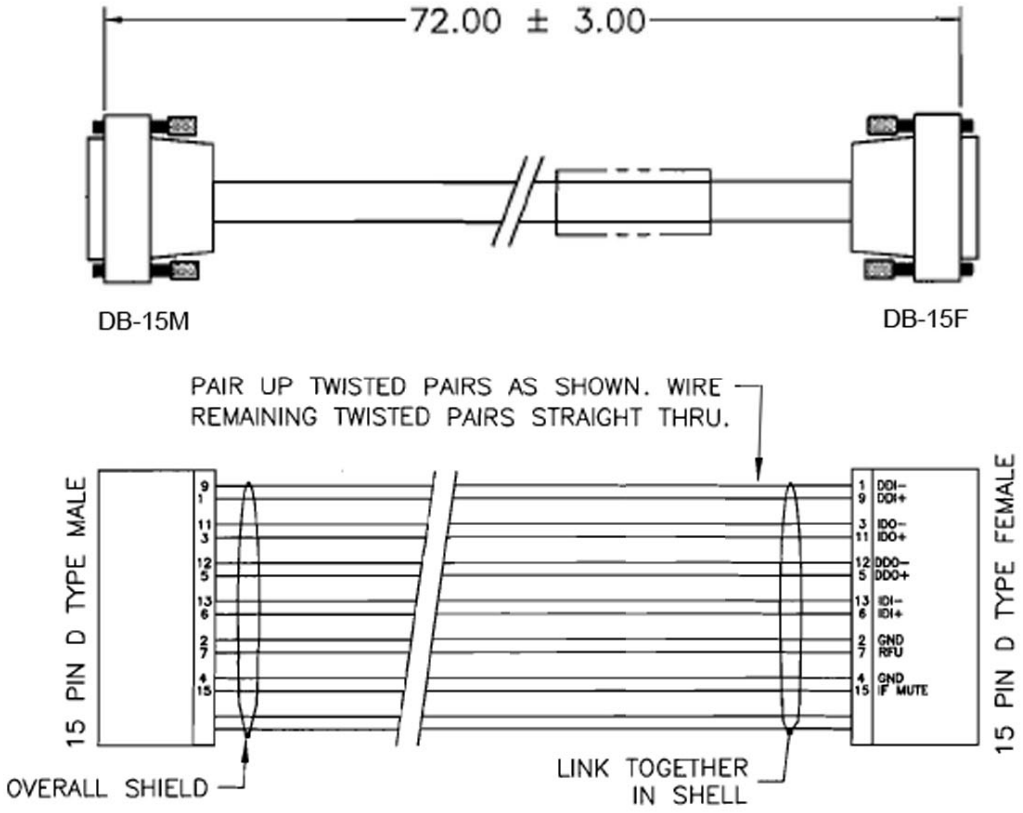


Figure A-14. Balanced G.703 Data Cable (CA/WR11999-6)

A.4.3 Balanced G.703 Data Cable, DB-15

Figure A-15 shows the data cable for connection between the Switch and Modem or between the Switch and the User data. This cable is used with the CDM-600/600L, CDM-Qx / QxL, and SLM-5650/5650A modems.

INDICATORS		
15M	NOTES	15M
1	TO	1
2	TO	2
3	TO	3
4	TO	4
5	TO	5
6	TO	6
7	TO	7
9	TO	9
11	TO	11
12	TO	12
13	TO	13
15	TO	15

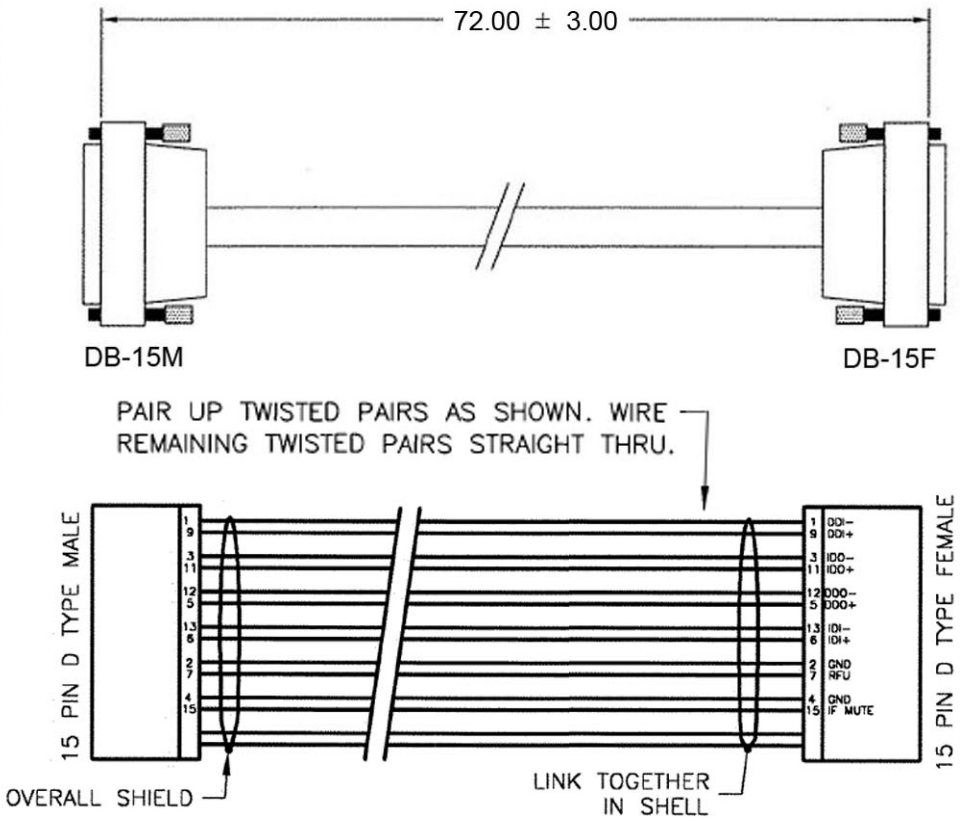
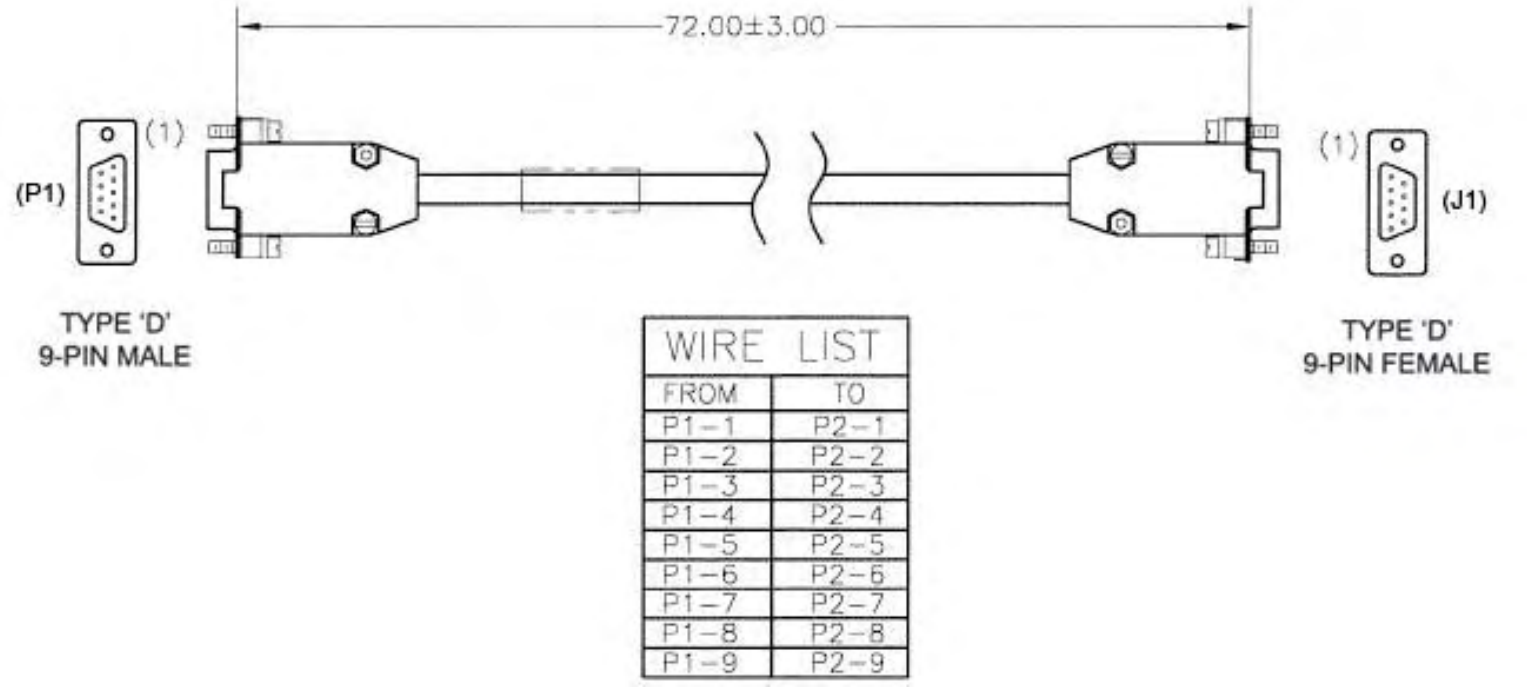

72.00 ± 3.00
DB-15M
DB-15F
PAIR UP TWISTED PAIRS AS SHOWN. WIRE REMAINING TWISTED PAIRS STRAIGHT THRU.
15 PIN D TYPE MALE
15 PIN D TYPE FEMALE
OVERALL SHIELD
LINK TOGETHER IN SHELL

Figure A-15. Balanced G.703 Data Cable (CA/WR9038-6)

A.4.4 Audio Data Cable, DB-9

Figure A-16 shows the cable used for handling Audio data between the CRS-350 ESC switch and CDM-600/600L modem.



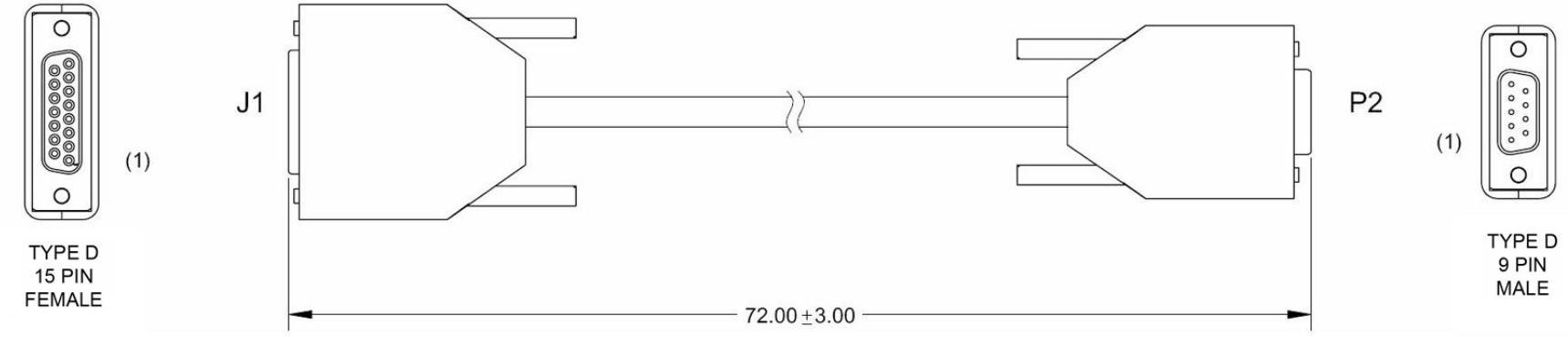
WIRE LIST

FROM	TO
P1-1	P2-1
P1-2	P2-2
P1-3	P2-3
P1-4	P2-4
P1-5	P2-5
P1-6	P2-6
P1-7	P2-7
P1-8	P2-8
P1-9	P2-9

Figure A-16. Audio Data Cable (CA/WR9932-1)

A.4.5 Balanced G.703 Data Cable for CDM-625

Figure A-17 shows the cable assembly used to connect the Balanced G.703 data between the Switch and the CDM-625 modem.

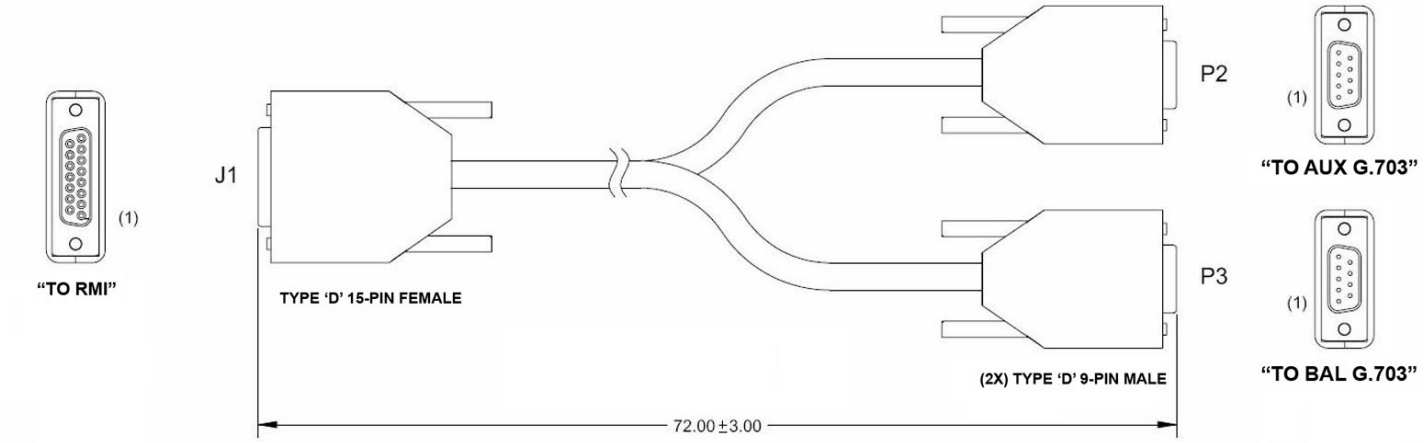


WIRE LIST		
FROM	TO	COMMENTS
J1-1	P2-9	TWISTED PAIR
J1-9	P2-5	
J1-3	P2-1	TWISTED PAIR
J1-11	P2-6	
J1-5	P2-4	TWISTED PAIR
J1-12	P2-8	
J1-6	P2-7	TWISTED PAIR
J1-13	P2-2	
J1-2, J1-4	P2-3	SHIELD, ITEM 8
J1-7	N/C	-
J1-8	N/C	-
J1-10	N/C	-
J1-14	N/C	-
J1-15	N/C	-

Figure A-17. CDM-625 Bal G.703 Data Cable (CA-0000072)

A.4.6 Quad E1 'Y' Data Cable for CDM-625

Figure A-18 shows the cable assembly used to connect the Quad E1 data between the CRS-310 RMI and the CDM-625 modem.



WIRE LIST		
FROM	TO	COMMENTS
J1-1	P3-4	TWISTED PAIR
J1-2, J1-4	P3-8	
J1-3	P3-6	TWISTED PAIR
J1-2, J1-4	P3-1, P3-3	
J1-5	P2-5	TWISTED PAIR
J1-2, J1-4	P2-9	
J1-6	P2-7	TWISTED PAIR
J1-2, J1-4	P2-2	
J1-7	N/C	-
J1-8	N/C	-
J1-9	P3-5	TWISTED PAIR
J1-2, J1-4	P3-9	
J1-10	N/C	-
J1-11	P3-7	TWISTED PAIR
J1-2, J1-4	P3-2	
J1-12	P2-4	TWISTED PAIR
J1-2, J1-4	P2-8	
J1-13	P2-6	TWISTED PAIR
J1-2, J1-4	P2-1, P2-3	
J1-14	N/C	-
J1-15	N/C	-

Figure A-18. CDM-625 Quad E1 'Y' Cable (CA-0000073)

A.4.7 ASI / Balanced G.703 / IF Cable, BNC 75Ω

Figure A-19 shows the 75Ω BNC cable used for the ASI and Balanced G.703 data connections between the CRS-300 and Modem. It is also used for connecting the Modem to the CRS-280 (70/140 MHz) IF Switch.

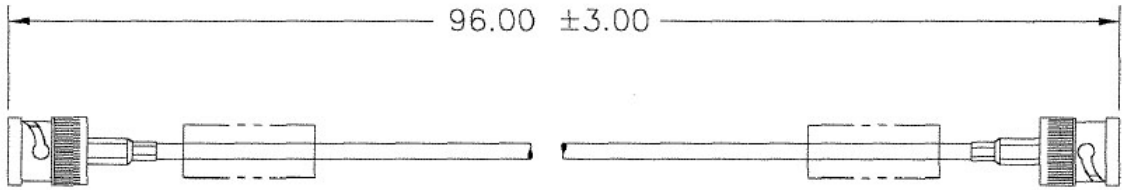
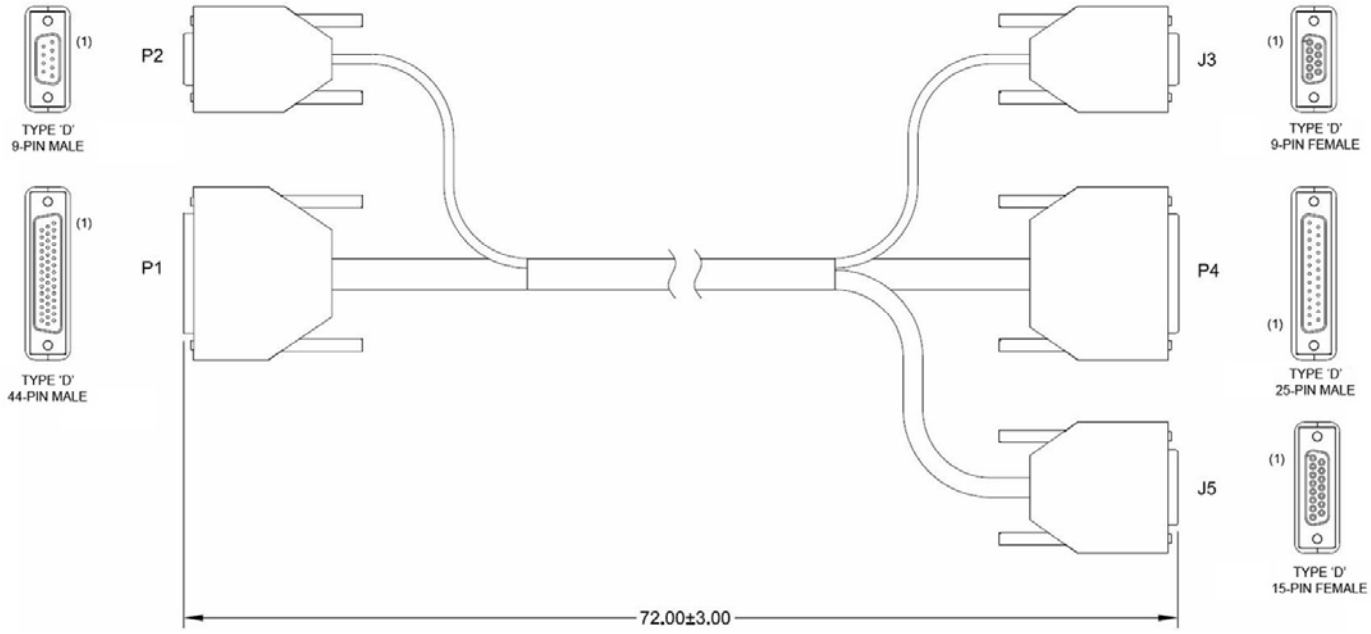


Figure A-19. ASI / Balanced G.703 / IF Cable, BNC 75Ω (PL/0813-8)

A.4.8 Overhead Data Cable for CDM-625

Figure A-20 shows the multi-purpose cable assembly used to connect the CDM-625 modem to the CRS-350 ESC Switch.



WIRE LIST		
FROM	TO	COMMENTS
P1-41	J3-1	TWISTED PAIR
P1-11	J3-6	
P1-40	J3-7	TWISTED PAIR
P1-26	J3-2	
P1-16	J3-3	
P1-10	J3-8	TWISTED PAIR
P1-25	J3-4	
P1-9	J3-5	TWISTED PAIR
P1-39	J3-9	
P1-4	J5-1	
P1-34	J5-2	
P1-3	J5-3	
P1-33	J5-4	
P1-2	J5-5	
P1-32	J5-6	
P1-1	J5-7	
P1-31	J5-8	
P1-20	J5-9	
P1-28	J5-10	
P1-19	J5-11	
P1-15	J5-12	
P1-18	J5-13	
P1-42	J5-14	
P1-17	J5-15	
P1-24	P4-1	
P1-6	P4-2	TWISTED PAIR
P1-36	P4-14	
P1-44	P4-3	TWISTED PAIR
P1-30	P4-16	
P1-13	P4-4	TWISTED PAIR
P1-43	P4-19	
P1-37	P4-7	
P1-14	P4-9	TWISTED PAIR
P1-29	P4-17	
P1-7	P4-11	TWISTED PAIR
P1-22	P4-24	
P1-27	P4-12	TWISTED PAIR
P1-12	P4-15	
P1-38	P4-18	
P1-21	P4-20	TWISTED PAIR
P1-35	P4-23	
P1-8	P4-21	
P1-23	P4-25	
P2-2	P4-6, P4-8	
P2-4	P4-10	
P2-7	P4-5, P4-13	
P2-5	P4-22	

Figure A-20. CDM-625 to CRS-350 Multi-purpose Cable (CA-0000074)

A.4.9 HSSI Data Cable, HD-50 Male

Figure A-21 shows the HSSI data cable used for connections between the Switch and the Modem.

FROM	TO	SIGNAL	COLOR	PAIR
		GND	DRAIN	
P1-1	P2-1	SIG GND	BLK	X
P1-26	P2-26		RED	
P1-2	P2-2	RT	BLK	X
P1-27	P2-27		WHT	
P1-3	P2-3	CA	BLK	X
P1-28	P2-28		GRN	
P1-4	P2-4	RD	BLK	X
P1-29	P2-29		BLU	
P1-5	P2-5	OPEN	BLK	X
P1-30	P2-30		YEL	
P1-6	P2-6	ST	BLK	X
P1-31	P2-31		BRN	
P1-7	P2-7	SG	BLK	X
P1-32	P2-32		ORG	
P1-8	P2-8	TA	RED	X
P1-33	P2-33		WHT	
P1-9	P2-9	TT	RED	X
P1-34	P2-34		GRN	
P1-10	P2-10	LA	RED	X
P1-35	P2-35		BLU	
P1-11	P2-11	SD	RED	X
P1-36	P2-36		YEL	
P1-12	P2-12	LB	RED	X
P1-37	P2-37		BRN	
P1-13	P2-13	SG	RED	X
P1-38	P2-38		ORG	
P1-14	P2-14	OPEN	GRN	X
P1-39	P2-39		WHT	
P1-15	P2-15	OPEN	GRN	X
P1-40	P2-40		BLU	
P1-16	P2-16	OPEN	GRN	X
P1-41	P2-41		YEL	
P1-17	P2-17	OPEN	GRN	X
P1-42	P2-42		BRN	
P1-18	P2-18	OPEN	GRN	X
P1-43	P2-43		ORG	
P1-19	P2-19	SIG GND	WHT	X
P1-44	P2-44		BLU	
P1-20	P2-20	OPEN	WHT	X
P1-45	P2-45		YEL	
P1-21	P2-21	OPEN	WHT	X
P1-46	P2-46		BRN	
P1-22	P2-22	OPEN	WHT	X
P1-47	P2-47		ORG	
P1-23	P2-23	OPEN	BLU	X
P1-48	P2-48		YEL	
P1-24	P2-24	OPEN	BLU	X
P1-49	P2-49		BRN	
P1-25	P2-25	SIG GND	BLU	X
P1-50	P2-50		ORG	

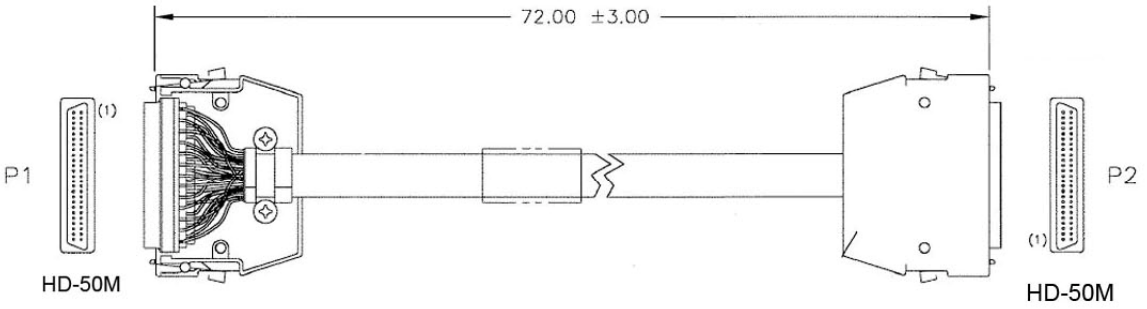


Figure A-21. HSSI Data Cable (CA/WR9189-6)

A.4.10 Quad E1 Data Cable for CDM-Qx / QxL

Figure A-22 shows the cable used to connect the Switch RMI (CRS-305) to the redundant CDM-Qx / QxL Quad E1 interface.

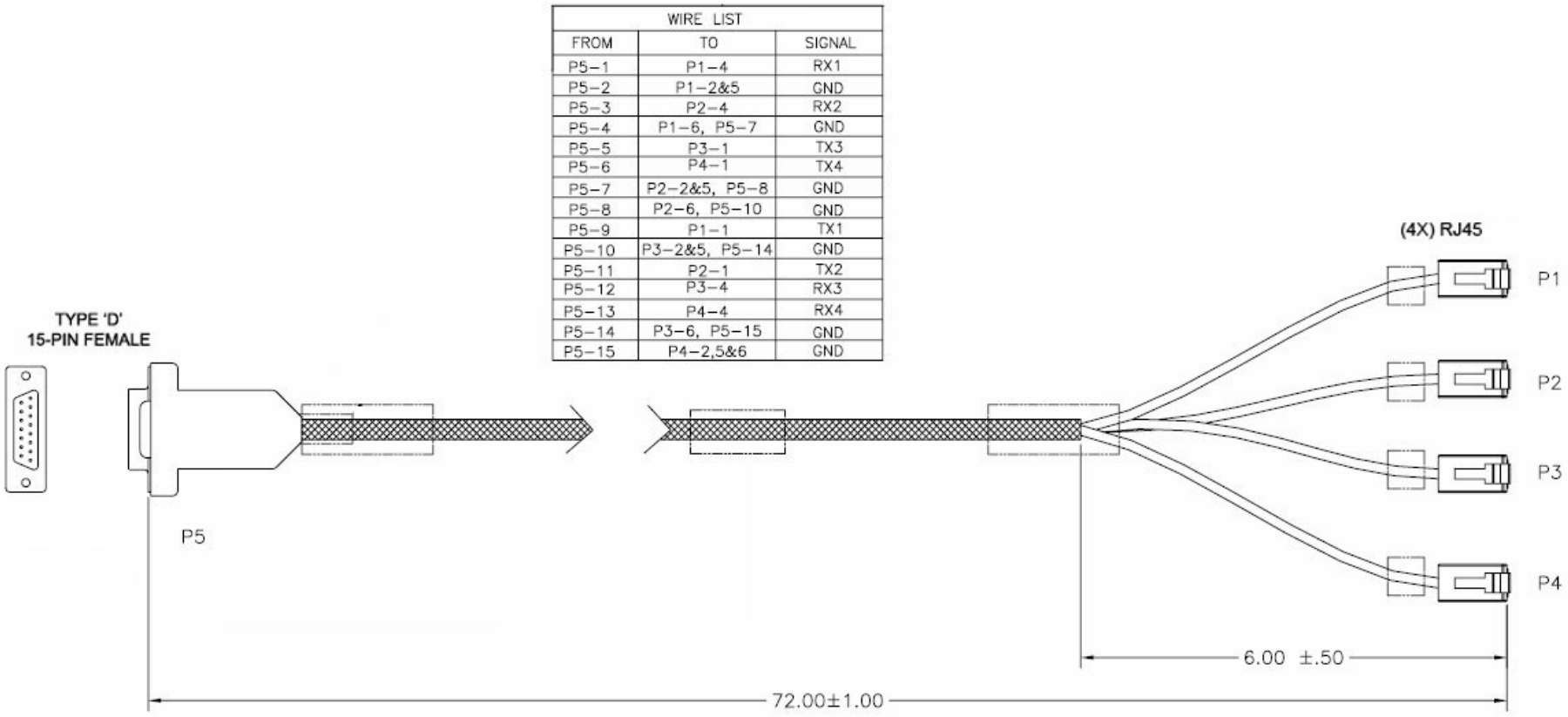
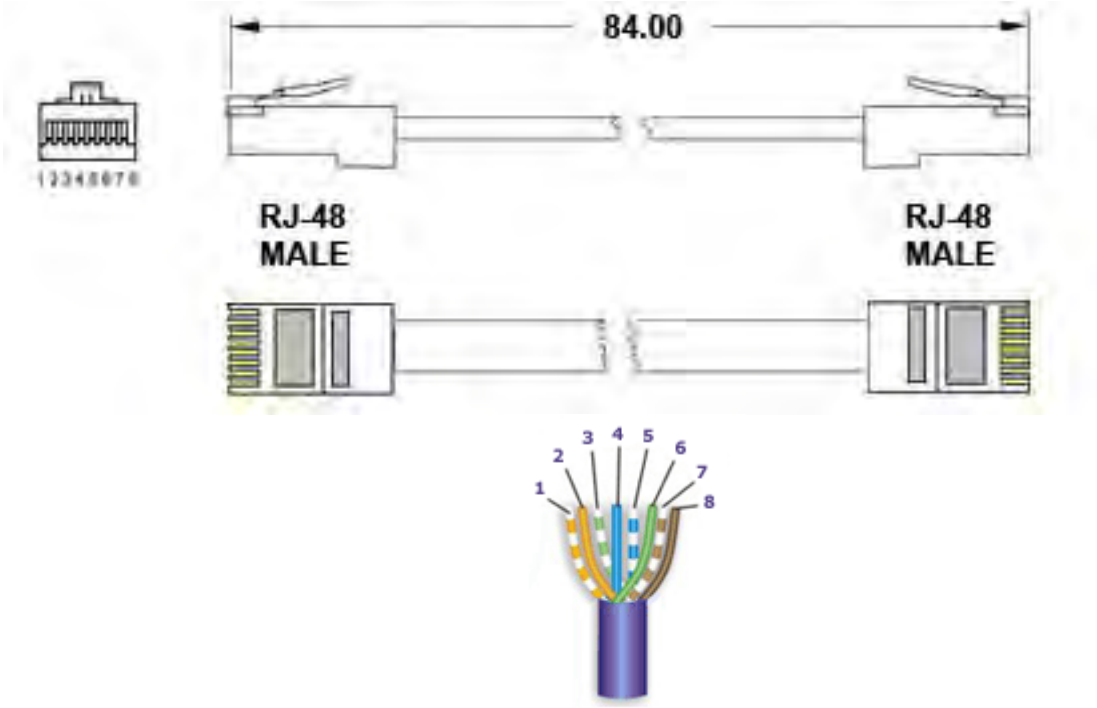


Figure A-22. CDM-Qx / QxL Quad E1 Data Cable (CA/WR13018)

A.4.11 Quad E1 / Gigabit Ethernet RJ-48 Connector Cable

Figure A-23 shows the cable used for the CDM-Qx / QxL Quad E1 data connections, and Gigabit Ethernet connections for the CDM-700, CDM-710, and SLM-5650/5650A modems.



T568B Wiring Diagram		
Pair No.	**Wire**	**Pin No.**
1	Blue/White tracer	5
	Blue	4
2	Orange/White tracer	1
	Orange	2
3	Green/White tracer	3
	Green	6
4	Brown/White tracer	7
	Brown	8

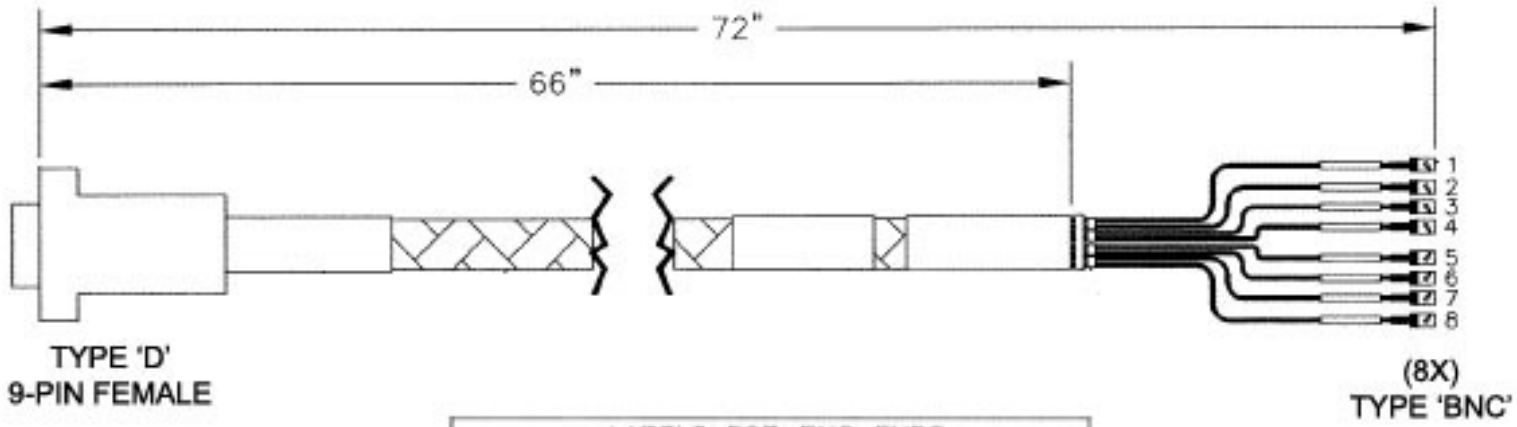
350 MHz Category 5E Patch Cable Specs:

- EIA/TIA TSB-40A ETL Verified
- Contact Gold Plating 50µ" (Short body)
- Assembly Strain Relief
- Stranded 50dB
- RoHS Compliant
- Length: 7 ft.

Figure A-23. Quad E1 / GigE Connector Cable (PP/CAT5FF7FTGY)

A.4.12 G.703 Data Cable for CDM-700

Figure A-24 shows the cable used to connect the CRS-345 Switch TMI to the Traffic CDM-700 G.703 Interface cards. Depending on the modem configuration, a modified version of this cable that employs only four of the eight BNC connectors is used. See **Chapter 4.7 CDM-700 Modem Connections** for illustrations of this alternate use.

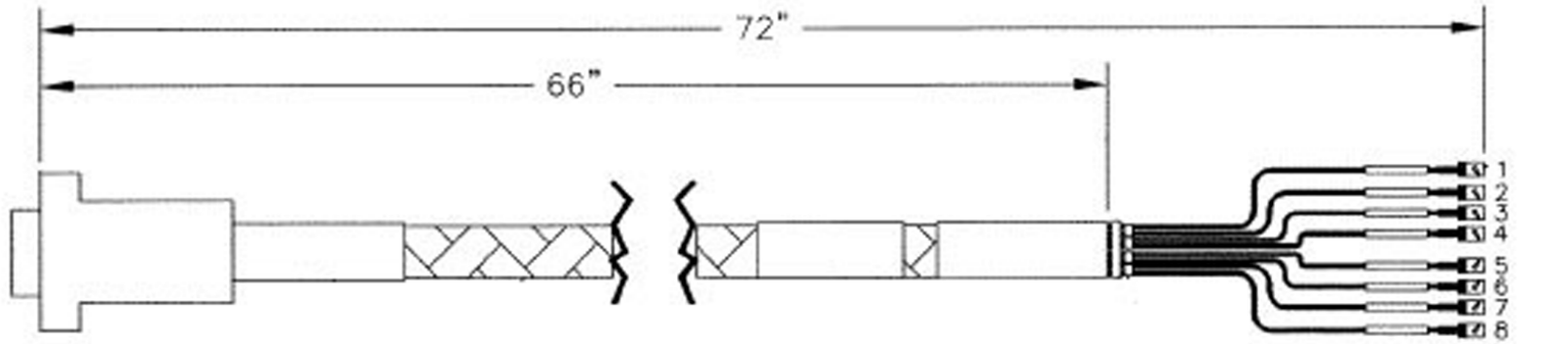


LABELS FOR BNC ENDS		
DB-9#	LABEL TEXT	PAIRS
1	Rx, PORT 1, SLOT 1	1
2	Tx, PORT 1, SLOT 1	
3	Rx, PORT 2, SLOT 1	2
4	Tx, PORT 2, SLOT 1	
5	Rx, PORT 1, SLOT 2	3
6	Tx, PORT 1, SLOT 2	
7	Rx, PORT 2, SLOT 2	4
8	Tx, PORT 2, SLOT 2	

Figure A-24. CDM-700 G.703 Data Cable (CA/RF12278-1)

A.4.13 G.703 Data Cable for CDM-700

Figure A-25 shows the cable used to connect the CRS-306 Switch RMI to the Redundant CDM-700 G.703 Interface cards. Depending on the modem configuration, a modified version of this cable that employs only four of the eight BNC connectors is used. See **Chapter 4.7 CDM-700 Modem Connections** for illustrations of this alternate use.



LABELS FOR BNC ENDS		
DB-15#	LABEL TEXT	PAIRS
11	Rx, PORT 1, SLOT 1	1
9	Tx, PORT 1, SLOT 1	
3	Rx, PORT 2, SLOT 1	2
1	Tx, PORT 2, SLOT 1	
5	Rx, PORT 1, SLOT 2	3
6	Tx, PORT 1, SLOT 2	
12	Rx, PORT 2, SLOT 2	4
13	Tx, PORT 2, SLOT 2	

Figure A-25. CDM-700 G.703 Data Cable (CA/RF12279-1)

A.4.14 IF Cable, BNC 50Ω

Figure A-26 shows the 50Ω BNC cable used for connecting the Modem to the CRS-280 (70/140 MHz) IF Switch.

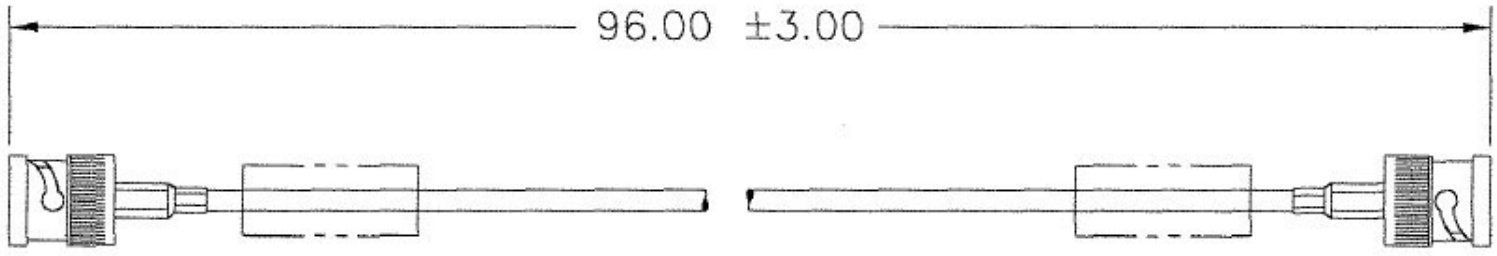
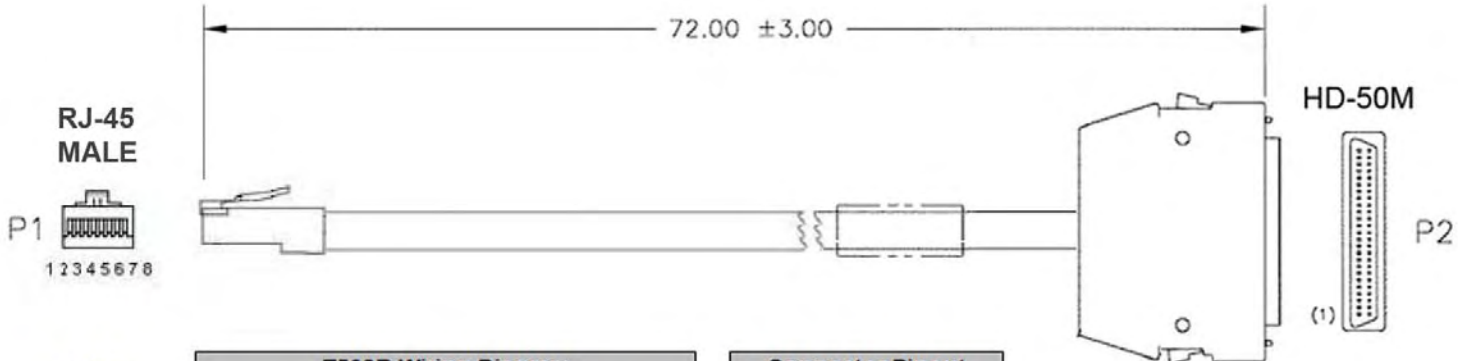
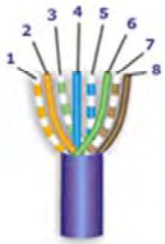


Figure A-26. IF Cable, BNC 50Ω for CRS-280 (70/140 MHz) IF Switch (PL/0946-2)

A.4.15 Ethernet Data Cable for CDM-625

Figure A-27 shows the Ethernet Data cable used for connecting the CDM-625 to the CRS-300 RMI (CRS-310).





T568B Wiring Diagram		
Pair No.	**Wire**	**Pin No.**
1	Blue/White tracer	5
	Blue	4
2	Orange/White tracer	1
	Orange	2
3	Green/White tracer	3
	Green	6
4	Brown/White tracer	7
	Brown	8

350 MHz Category 5E Patch Cable Specs:

- EIA/TIA TSB-40A ETL Verified
- Contact Gold Plating 50µ" (Short body)
- Assembly Strain Relief
- Stranded 50dB
- RoHS Compliant

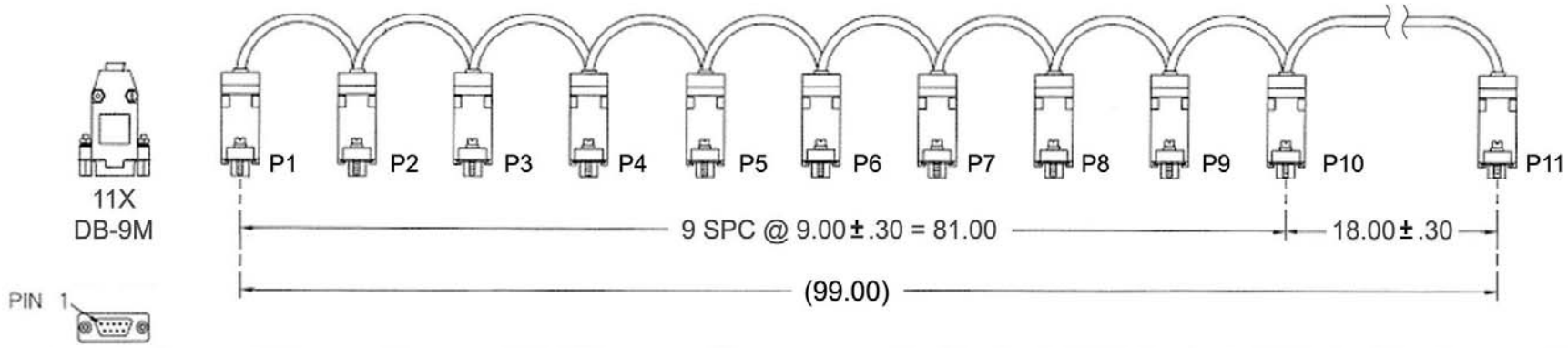
Connector Pinout	
RJ-45 (P1)	**HSSI (P2)**
1 (Tx+)	11 (SD+)
2 (Tx-)	36 (SD-)
3 (Rx+)	4 (RD+)
4 (Rx -)	29 (RD-)

Figure A-27. Ethernet Data Cable for CDM-625 (CA-0000121)

A.4.16 Multi-drop CnC® Plus Shielded Data Cable for CDM-625, (11X) DB-9M

Figure A-28 shows the DB-9 Multi-drop shielded data cable used for connecting the Redundancy-enabled CnC® CDM-625 modems in a CRS-300 1:10 Redundancy system.

Note: This cable bypasses the CRS-300 1:10 Redundancy Switch.



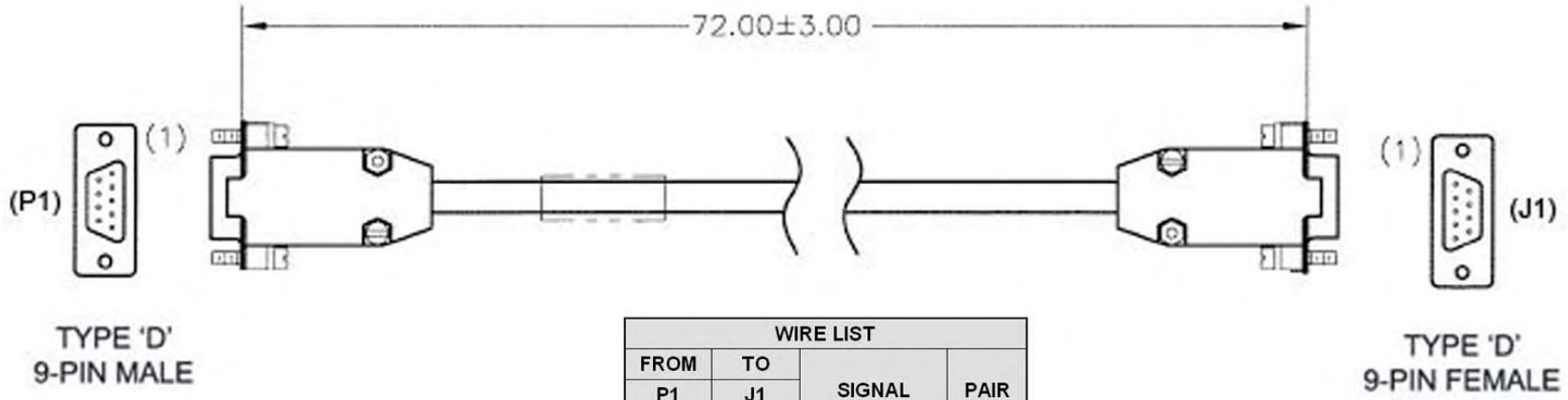
RESISTOR JUMPER WIRING		
FROM	TO	JUMPER
P1-2	P1-6	ITEM 7 (SEE BOM, CEFD DWG NOTE 6)
P1-3	P1-7	
P1-4	P1-8	
P1-5	P1-9	
P11-2	P11-6	
P11-3	P11-7	
P11-4	P11-8	
P11-5	P11-9	

WIRE LIST												
FROM	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	COLOR	PAIR
P1-2	P2-2	P3-2	P4-2	P5-2	P6-2	P7-2	P8-2	P9-2	P10-2	P11-2	BLU	X
P1-6	P2-6	P3-6	P4-6	P5-6	P6-6	P7-6	P8-6	P9-6	P10-6	P11-6	BLK	
P1-3	P2-3	P3-3	P4-3	P5-3	P6-3	P7-3	P8-3	P9-3	P10-3	P11-3	RED	X
P1-7	P2-7	P3-7	P4-7	P5-7	P6-7	P7-7	P8-7	P9-7	P10-7	P11-7	BLK	
P1-4	P2-4	P3-4	P4-4	P5-4	P6-4	P7-4	P8-4	P9-4	P10-4	P11-4	GRN	X
P1-8	P2-8	P3-8	P4-8	P5-8	P6-8	P7-8	P8-8	P9-8	P10-8	P11-8	BLK	
P1-5	P2-5	P3-5	P4-5	P5-5	P6-5	P7-5	P8-5	P9-5	P10-5	P11-5	WHT	X
P1-9	P2-9	P3-9	P4-9	P5-9	P6-9	P7-9	P8-9	P9-9	P10-9	P11-9	BLK	

Figure A-28. Multi-drop CnC® Plus Shielded Data Cable for CDM-625 (CA-0000275)

A.4.17 Quad E1 Data Cable for CDM-625, DB-9

Figure A-29 shows the DB-9 data cable used for the Quad E1 data connections between the CRS-365D TMI and the CDM-625 modem.

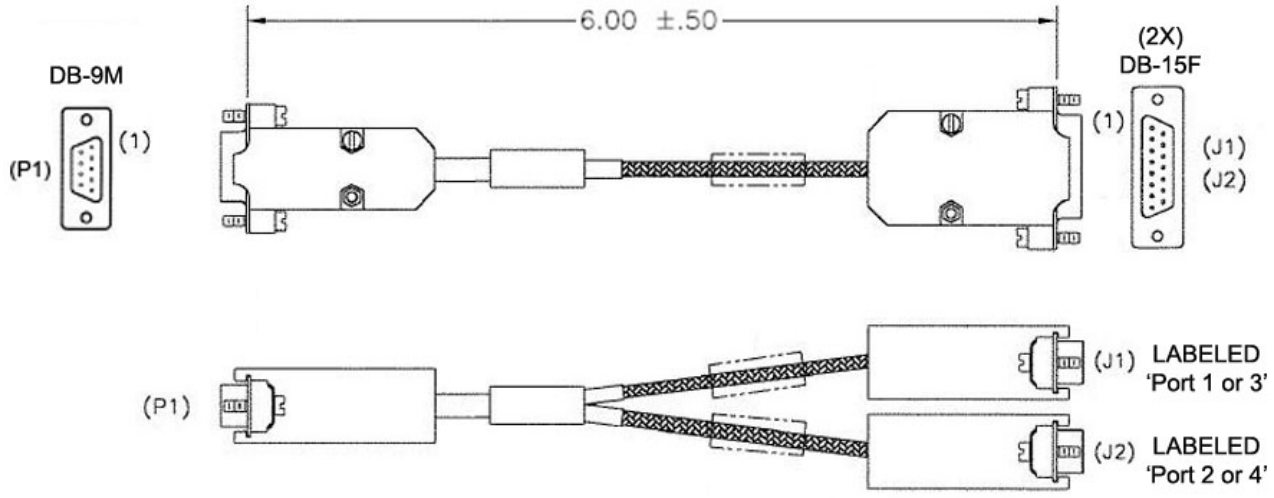


WIRE LIST			
FROM P1 PIN #	TO J1 PIN#	SIGNAL	PAIR
1	1	Port 4 Rx-	X
6	6	Port 4 Rx+	
2	2	Port 4 Tx-	X
7	7	Prot 4 Tx+	
3	3	Gnd drain wire	
8	8	Port 3 Rx-	X
4	4	Port 3 Rx+	
9	9	Port 3 Tx-	X
5	5	Port 3 Tx+	

Figure A-29. Quad E1 Data Cable for CDM-625 (CA-0000136)

A.4.18 Quad E1 Data Adapter Cable for CDM-625

Figure A-30 shows the data cable used to adapt the Type 'D' 9-pin female Balanced G.703 or Auxiliary G.703 connectors to a standard Type 'D' 15-pin connector pair for Quad E1 operation.

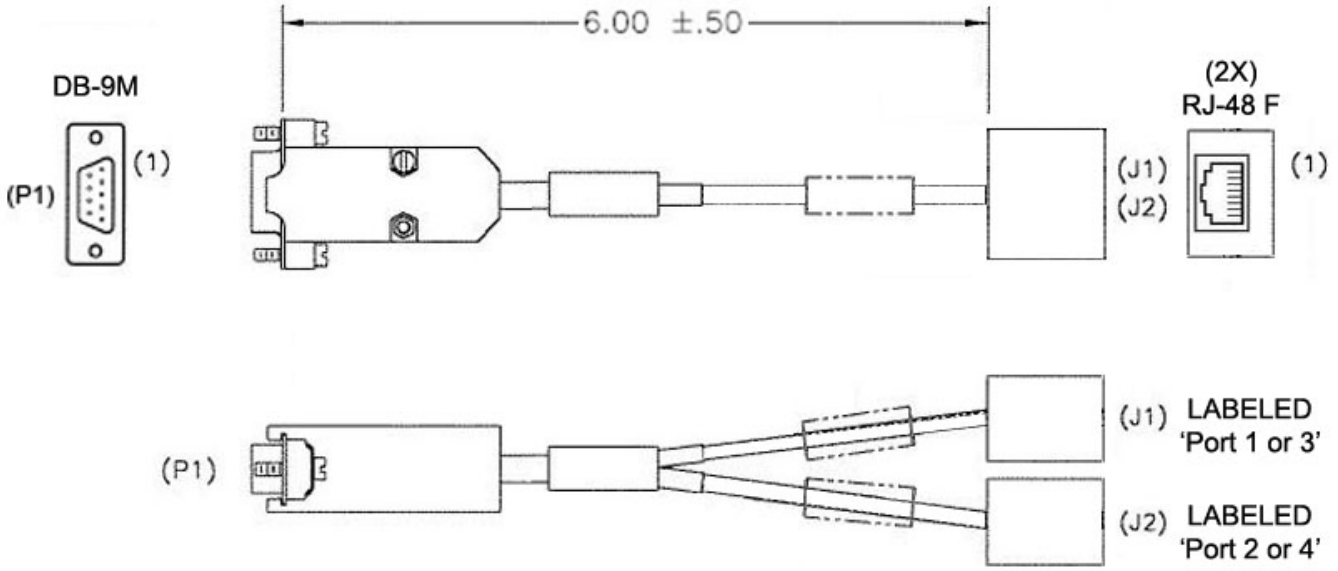


P1	J1	J2	Twisted Pair	Signal Function
5	9		X	Port 1 or 3 Tx In +
9	1			Port 1 or 3 Tx In -
4	11		X	Port 1 or 3 Rx In +
8	3			Port 1 or 3 Rx In -
7		9	X	Port 2 or 4 Tx In +
2		1		Port 2 of 4 Tx In -
6		11	X	Port 2 or 4 Rx In +
1		3		Port 2 or 4 Rx In -
3	2	2	-	GND

Figure A-30. Quad E1 Data Cable for CDM-625 (CA-0000163)

A.4.19 Quad E1 Data Adapter Cable for CDM-625

Figure A-31 shows the data cable used to adapt the Type 'D' 9-pin female Balanced G.703 or Auxiliary G.703 connectors to a standard RJ-48 connector pair for Quad E1 operation.

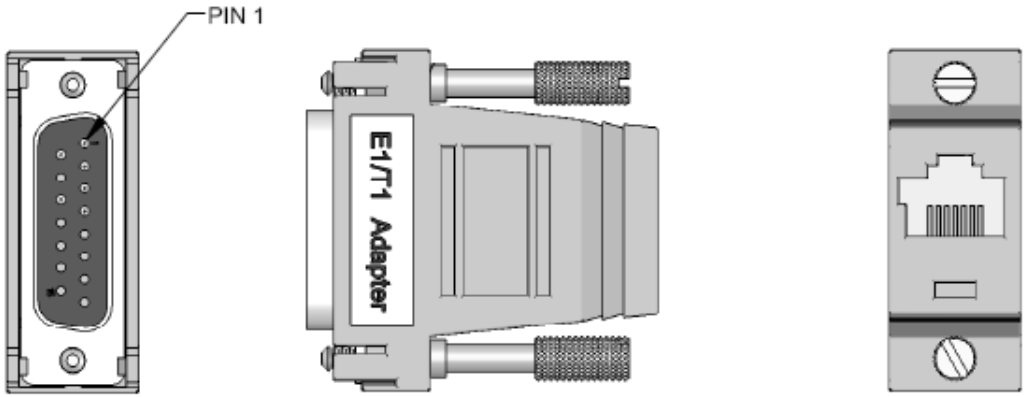


P1	J1	J2	Twisted Pair	Signal Function
5	1		X	Port 1 or 3 Tx In +
9	2			Port 1 or 3 Tx In -
4	4		X	Port 1 or 3 Rx In +
8	5			Port 1 or 3 Rx In -
7		1	X	Port 2 or 4 Tx In +
2		2		Port 2 of 4 Tx In -
6		4	X	Port 2 or 4 Rx In +
1		5		Port 2 or 4 Rx In -
3	3	3	-	GND

Figure A-31. Quad E1 Data Cable for CDM-625 (CA-0000164)

A.4.20 T1/E1 Adapter for CDM-570/570L, -600/600L

Figure A-32 shows the optional adapter used to convert the Type 'D' 15-pin female Balanced G.703 connector on the User side of the TMI to a standard RJ-48 female connector for T1/E1 operation.



WIRE LEGEND			
RJ-48 PIN #	**DB-15M PIN #**	**WIRE COLOR**	**SIGNAL NAME**
1	9	BLUE	Tx+
2	1	ORANGE	Tx-
3	2	BLACK	GND
4	11	RED	Rx+
5	3	GREEN	Rx-
6	4	YELLOW	GND
7		BROWN	NC
8		WHITE	NC

Figure A-32. T1/E1 Adapter for CDM-570/570L, -600/600L (CN-00002680

Appendix B. ADDRESSING SCHEME INFORMATION

B.1 Introduction to Addressing

A CRS-300 1:10 Redundancy Switch provides 1:10 redundancy; that is, it is capable of controlling up to 10 traffic modems and one redundant modem.

The user can remotely communicate to the Switch or any of the modems, via the DB-9, EIA-232 or EIA-485 Remote connector on the CRS-230 Switch Controller card (installed in the CRS-300). A direct User-to-modem connection is not permissible in this configuration – master operation is restricted to the Switch in a redundancy system.

For Switch to modem communications with the CDM-570/570L, CDM-600/600L, CDM-625, CDM-700, CDM-710 and SLM-5650/5650A modems, the Switch uses serial communications via a DB-25 data cable or an HD-15 Control Cable that is connected between each modem and the Switch-installed TMIs.

For Switch to modem communications on the CDM-Qx/QxL modems, the Switch uses EIA-485 communications via a DB-9 multi-drop cable that is connected from the “485 Pass-Through” connector on the CRS-230, then daisy-chained to each of the modems.

For the modems that are configured for EDMAC framing, Monitor & Control (M&C) information may be communicated to the modems and transceivers at the distant-end of the link. In order for an M&C application to be able to communicate with the various devices connected to the Switch, the correct addresses must be used.

This appendix provides details of the address requirements to allow M&C of the Switch, various modems, and transceivers that may be included in a CRS-300 1:N Redundancy System.

B.2 Switch Addresses

The permitted Switch remote control addresses are limited:

- **For EIA-485** connections, the only permitted addresses are 1000, 3000, 5000, and 7000.
- **For EIA-232**, the only permitted address is 0000.

Note: The Switch settings for external communications are totally independent from the internal communication between Switch and traffic modems.

B.3 Modem and Transceiver Addresses

To monitor and control modems and transceivers at the distant-end of the communication link, EDMAC must be enabled, via the modem front panel, in local mode. Set the Tx and Rx parameters to establish the link on the modems on each end of the link. Then an M&C application can be used.

Examples of EIA-232 and EIA-485 addressing schemes are shown in the diagrams that follow. Included in these diagrams is the following terminology:

Abbreviation	Explanation
MCA	Monitor & Control Address, to be entered as the address of a unit into an M&C application, e.g., SatMac. Modem addresses are automatically assigned by the TMI/RMI slot positions to which they are associated within a Switch. When using EIA-485 multi-drop, the Switch bus address be changed on the Switch by the User to 1000, 3000, 5000, 7000, or 9000 (7000 is shown in the figures in this appendix as an example only).
RCA	Remote Control Address, to be configured, via the unit front panel (CONFIG:REMOTE)
ESA	EDMAC Slave Address (Range) Local modem is configured as EDMAC master Distant-end modem is an EDMAC slave

The CDM-700/710 and SLM-5650/5650A modems utilize a point-to-point internal serial communications bus to the Switch within the HD-15 cable. **Figure B-1** illustrates an external EIA-232 addressing scheme for these modems; **Figure B-2** depicts an external EIA-485 connection.

The CDM-Qx/QxL modems require an external multi-drop EIA-485 connection. **Figure B-3** illustrates the external EIA-232 addressing scheme for a system comprising these modems with a Switch; **Figure B-4** depicts the external EIA-485 connection for this configuration. For a distant-end CRS-300/Qx Switch using Traffic modems in EDMAC Slave mode, refer to **Figure B-5**.

The CDM-570/570L, CDM-600/600L and CDM-625 modems utilize point-to-point internal serial communication bus to the Switch within the DB-25 or DB-9 cable. **Figure B-6** illustrates an external EIA-232 addressing scheme for these modems; **Figure B-7** depicts an external EIA-485 connection.

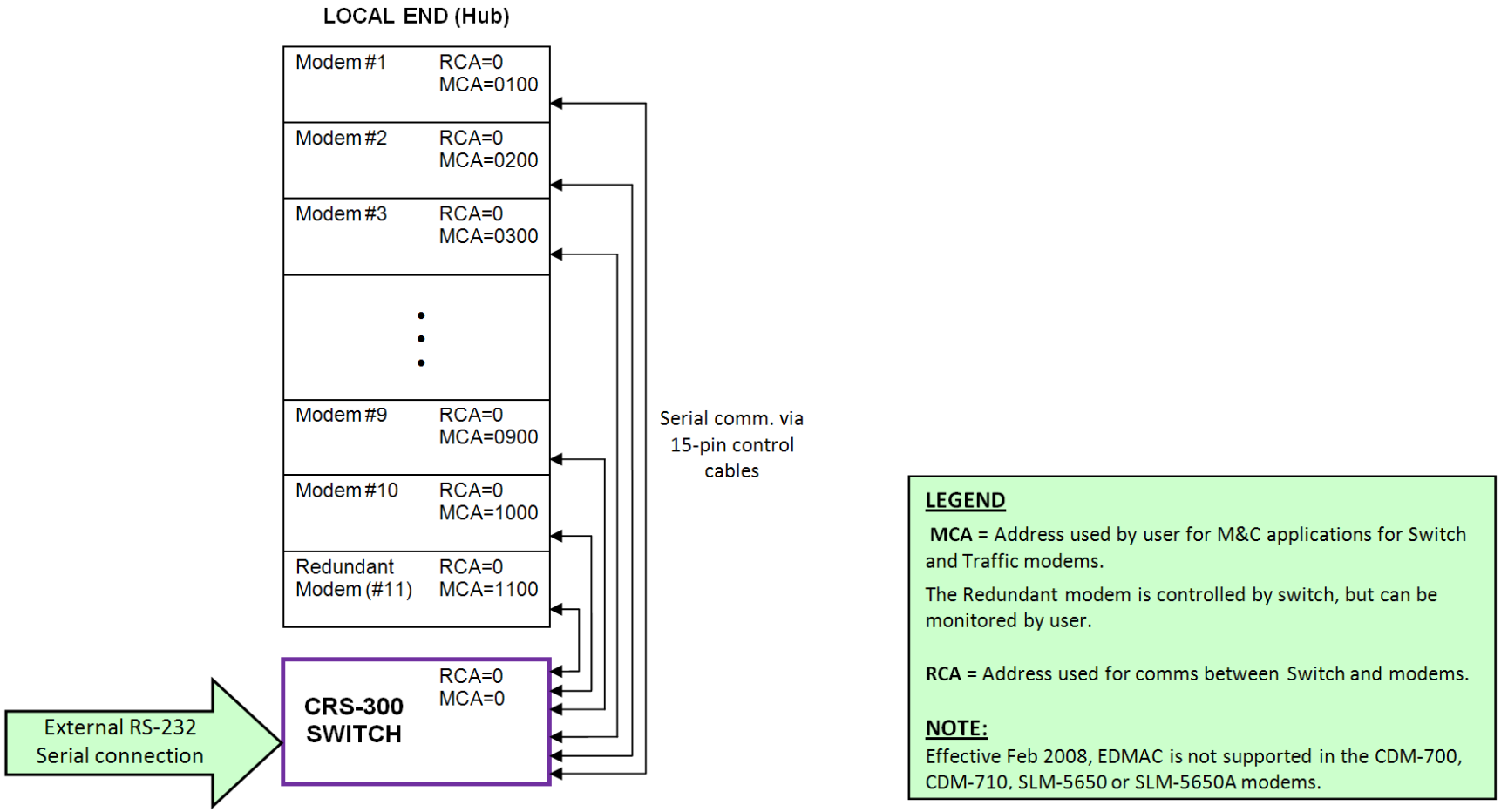


Figure B-1. CRS-300 Addressing Scheme Example: External EIA-232 with CDM-700/710, SLM-5650/5650A Modems

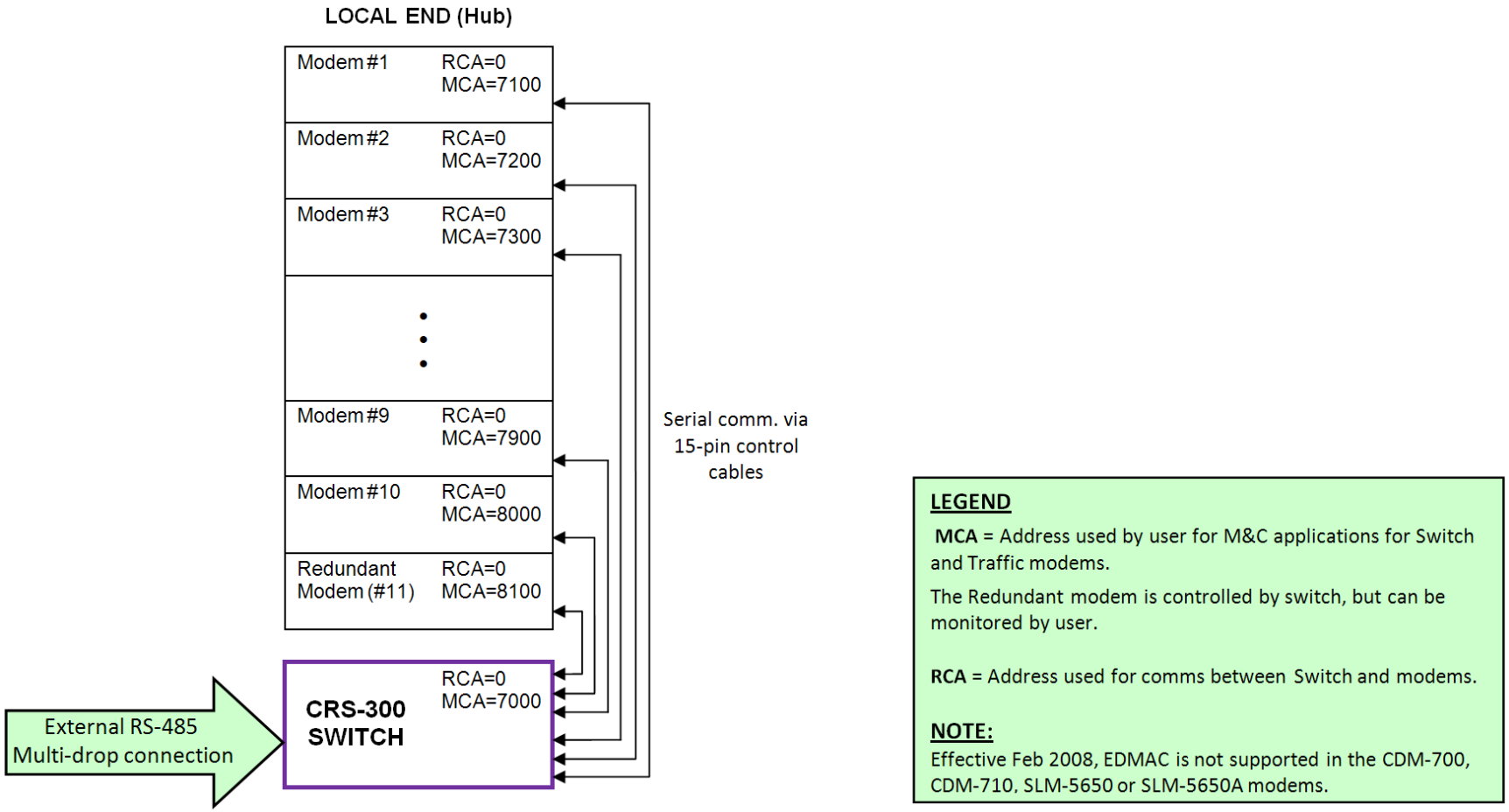


Figure B-2. CRS-300 Addressing Scheme Example: External EIA-485 with CDM-700/710, SLM-5650/5650A Modems

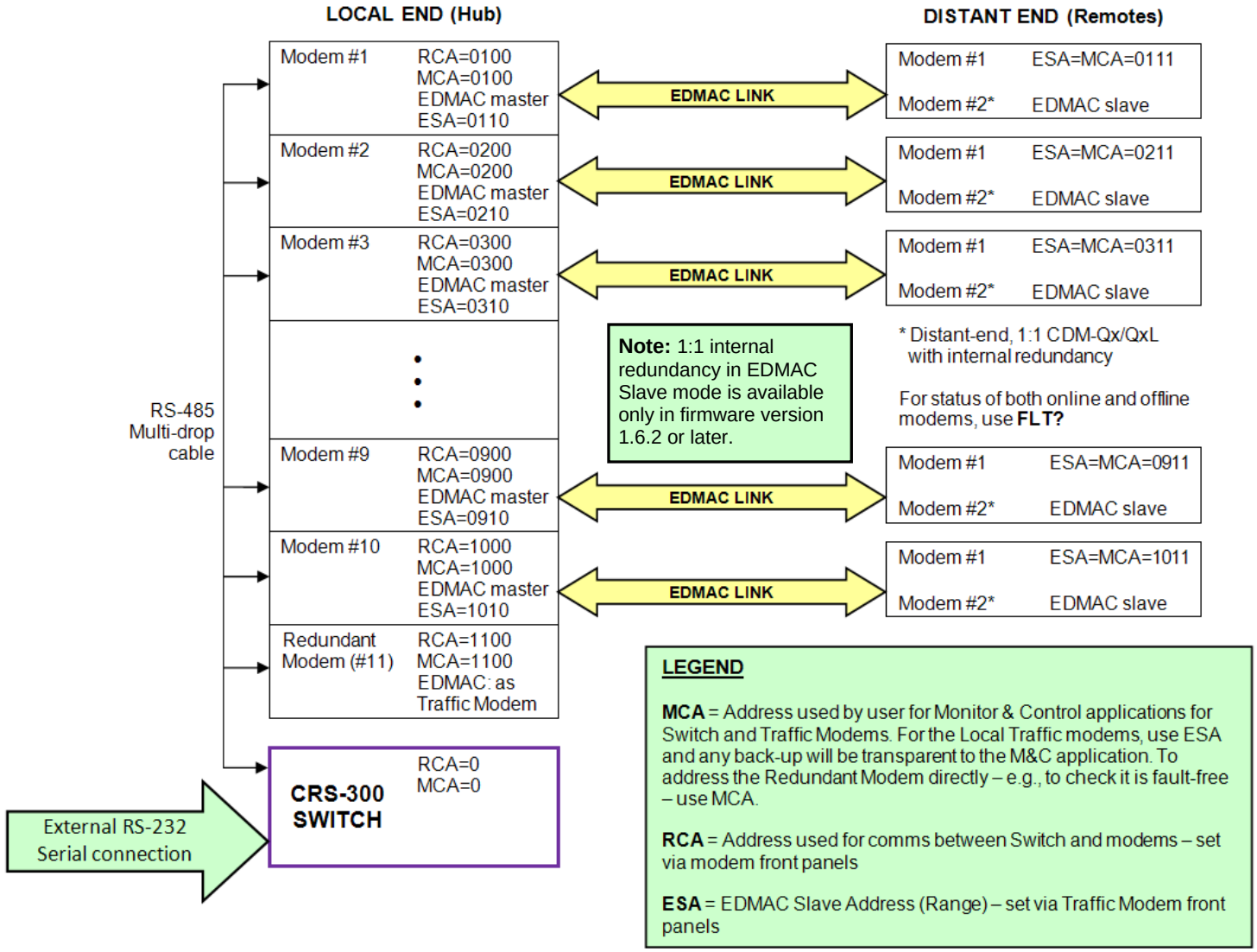

LOCAL END (Hub)
DISTANT END (Remotes)
Modem #1 RCA=0100 MCA=0100 EDMAC master ESA=0110
Modem #2 RCA=0200 MCA=0200 EDMAC master ESA=0210
Modem #3 RCA=0300 MCA=0300 EDMAC master ESA=0310
Modem #9 RCA=0900 MCA=0900 EDMAC master ESA=0910
Modem #10 RCA=1000 MCA=1000 EDMAC master ESA=1010
Redundant Modem (#11) RCA=1100 MCA=1100 EDMAC: as Traffic Modem
EDMAC LINK
Modem #1 ESA=MCA=0111
Modem #2* EDMAC slave
Modem #1 ESA=MCA=0211
Modem #2* EDMAC slave
Modem #1 ESA=MCA=0311
Modem #2* EDMAC slave
Modem #1 ESA=MCA=0911
Modem #2* EDMAC slave
Modem #1 ESA=MCA=1011
Modem #2* EDMAC slave
Note: 1:1 internal redundancy in EDMAC Slave mode is available only in firmware version 1.6.2 or later.
* Distant-end, 1:1 CDM-Qx/QxL with internal redundancy
For status of both online and offline modems, use FLT?
RS-485 Multi-drop cable
CRS-300 SWITCH
RCA=0
MCA=0
External RS-232 Serial connection
LEGEND
MCA = Address used by user for Monitor & Control applications for Switch and Traffic Modems. For the Local Traffic modems, use ESA and any back-up will be transparent to the M&C application. To address the Redundant Modem directly – e.g., to check it is fault-free – use MCA.
RCA = Address used for comms between Switch and modems – set via modem front panels
ESA = EDMAC Slave Address (Range) – set via Traffic Modem front panels

Figure B-3. CRS-300 Addressing Scheme Example: External EIA-232 with CDM-Qx/QxL Modems

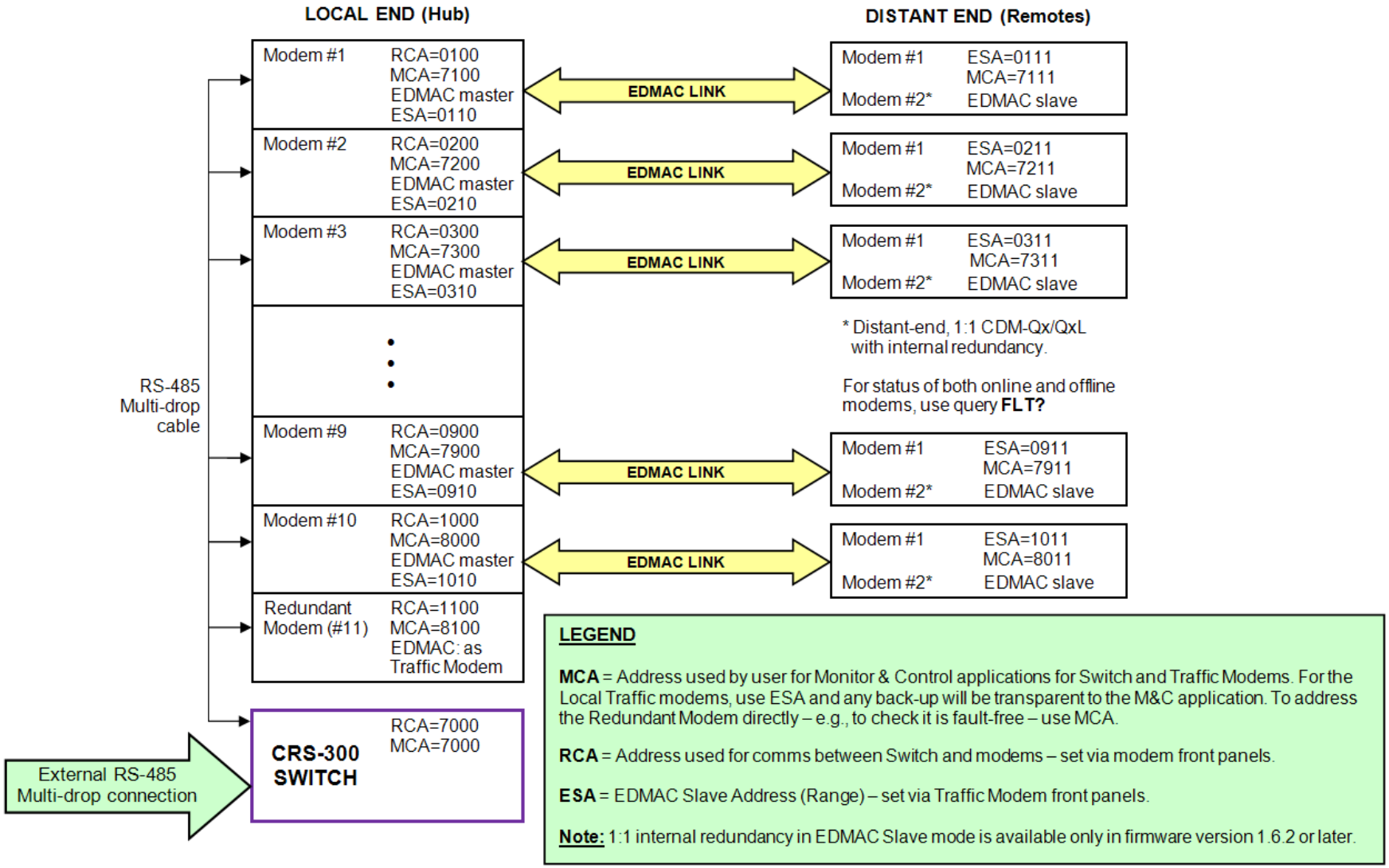

LOCAL END (Hub)
DISTANT END (Remotes)
Modem #1 RCA=0100 MCA=7100 EDMAC master ESA=0110
Modem #2 RCA=0200 MCA=7200 EDMAC master ESA=0210
Modem #3 RCA=0300 MCA=7300 EDMAC master ESA=0310
Modem #9 RCA=0900 MCA=7900 EDMAC master ESA=0910
Modem #10 RCA=1000 MCA=8000 EDMAC master ESA=1010
Redundant Modem (#11) RCA=1100 MCA=8100 EDMAC: as Traffic Modem
CRS-300 SWITCH RCA=7000 MCA=7000
RS-485 Multi-drop cable
External RS-485 Multi-drop connection
EDMAC LINK
Modem #1 ESA=0111 MCA=7111
Modem #1 ESA=0211 MCA=7211
Modem #1 ESA=0311 MCA=7311
Modem #1 ESA=0911 MCA=7911
Modem #1 ESA=1011 MCA=8011
Modem #2* EDMAC slave
* Distant-end, 1:1 CDM-Qx/QxL with internal redundancy.
For status of both online and offline modems, use query FLT?
LEGEND
MCA = Address used by user for Monitor & Control applications for Switch and Traffic Modems. For the Local Traffic modems, use ESA and any back-up will be transparent to the M&C application. To address the Redundant Modem directly – e.g., to check it is fault-free – use MCA.
RCA = Address used for comms between Switch and modems – set via modem front panels.
ESA = EDMAC Slave Address (Range) – set via Traffic Modem front panels.
Note: 1:1 internal redundancy in EDMAC Slave mode is available only in firmware version 1.6.2 or later.

Figure B-4. CRS-300 Addressing Scheme Example: External EIA-485 with CDM-Qx/QxL Modems

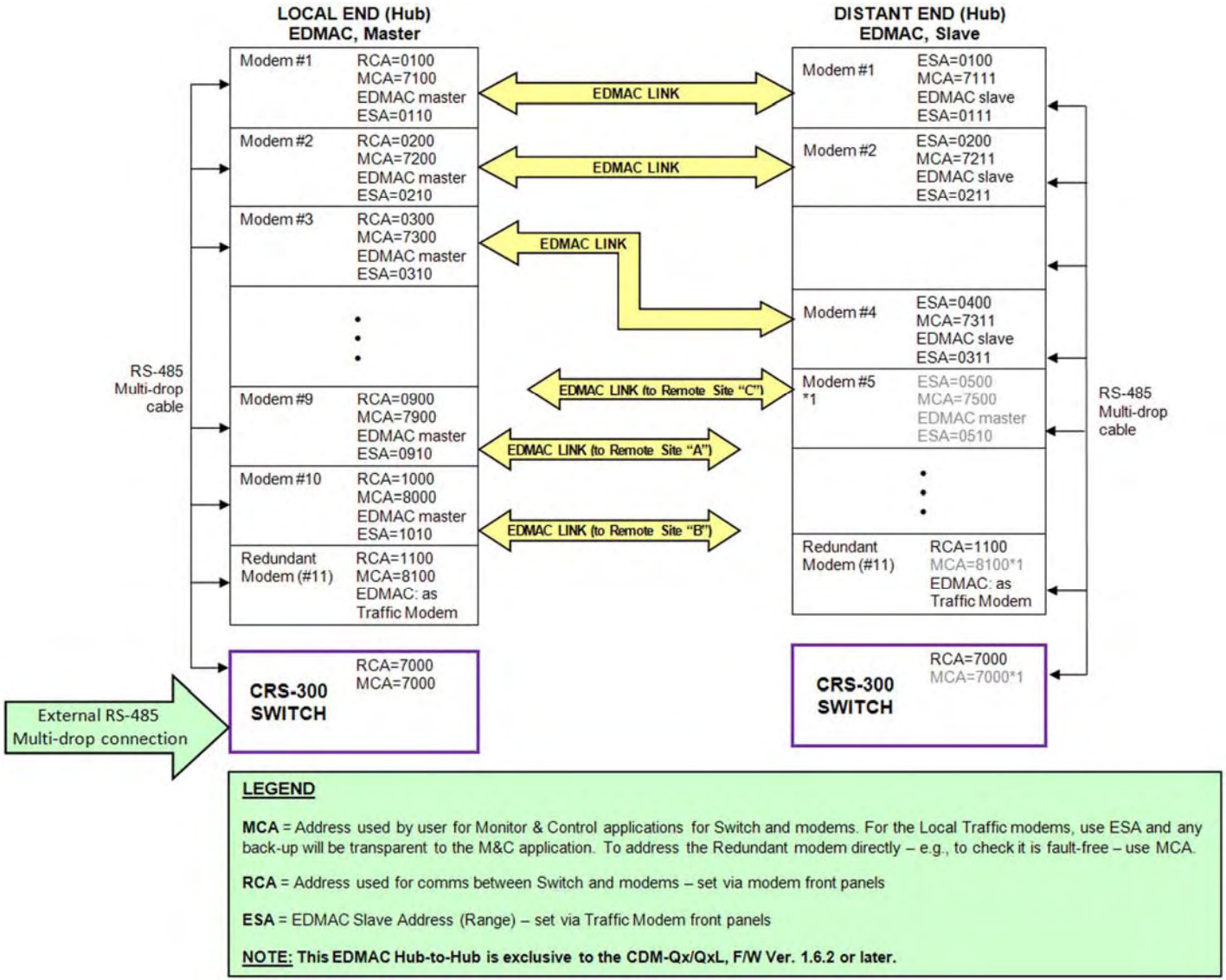


Figure B-5. CRS-300 Addressing Scheme Example: External EIA-485 with CDM-Qx/QxL Modems, EDMAC Hub-to-Hub

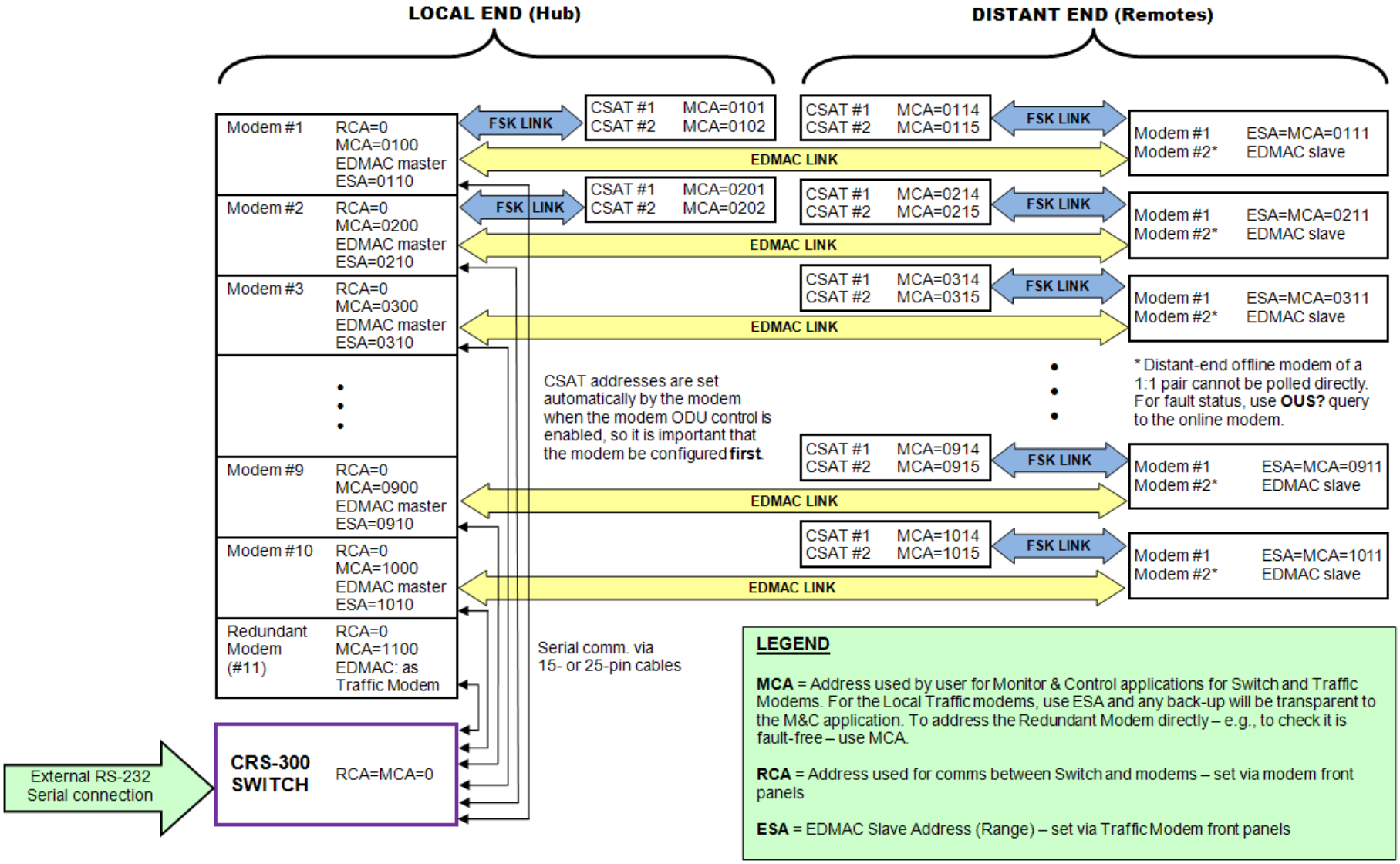

LOCAL END (Hub)
DISTANT END (Remotes)
Modem #1 RCA=0 MCA=0100 EDMAC master ESA=0110
Modem #2 RCA=0 MCA=0200 EDMAC master ESA=0210
Modem #3 RCA=0 MCA=0300 EDMAC master ESA=0310
Modem #9 RCA=0 MCA=0900 EDMAC master ESA=0910
Modem #10 RCA=0 MCA=1000 EDMAC master ESA=1010
Redundant Modem (#11) RCA=0 MCA=1100 EDMAC: as Traffic Modem
CRS-300 SWITCH RCA=MCA=0
External RS-232 Serial connection
FSK LINK
EDMAC LINK
CSAT #1 MCA=0101 CSAT #2 MCA=0102
CSAT #1 MCA=0114 CSAT #2 MCA=0115
Modem #1 Modem #2* ESA=MCA=0111 EDMAC slave
CSAT #1 MCA=0201 CSAT #2 MCA=0202
CSAT #1 MCA=0214 CSAT #2 MCA=0215
Modem #1 Modem #2* ESA=MCA=0211 EDMAC slave
CSAT #1 MCA=0314 CSAT #2 MCA=0315
Modem #1 Modem #2* ESA=MCA=0311 EDMAC slave
CSAT #1 MCA=0914 CSAT #2 MCA=0915
Modem #1 Modem #2* ESA=MCA=0911 EDMAC slave
CSAT #1 MCA=1014 CSAT #2 MCA=1015
Modem #1 Modem #2* ESA=MCA=1011 EDMAC slave
CSAT addresses are set automatically by the modem when the modem ODU control is enabled, so it is important that the modem be configured first.
* Distant-end offline modem of a 1:1 pair cannot be polled directly. For fault status, use OUS? query to the online modem.
Serial comm. via 15- or 25-pin cables
LEGEND
MCA = Address used by user for Monitor & Control applications for Switch and Traffic Modems. For the Local Traffic modems, use ESA and any back-up will be transparent to the M&C application. To address the Redundant Modem directly – e.g., to check it is fault-free – use MCA.
RCA = Address used for comms between Switch and modems – set via modem front panels
ESA = EDMAC Slave Address (Range) – set via Traffic Modem front panels

Figure B-6. CRS-300 Addressing Scheme Example: External EIA-232 with CDM-570/570L, -600/600L, -625 Modems

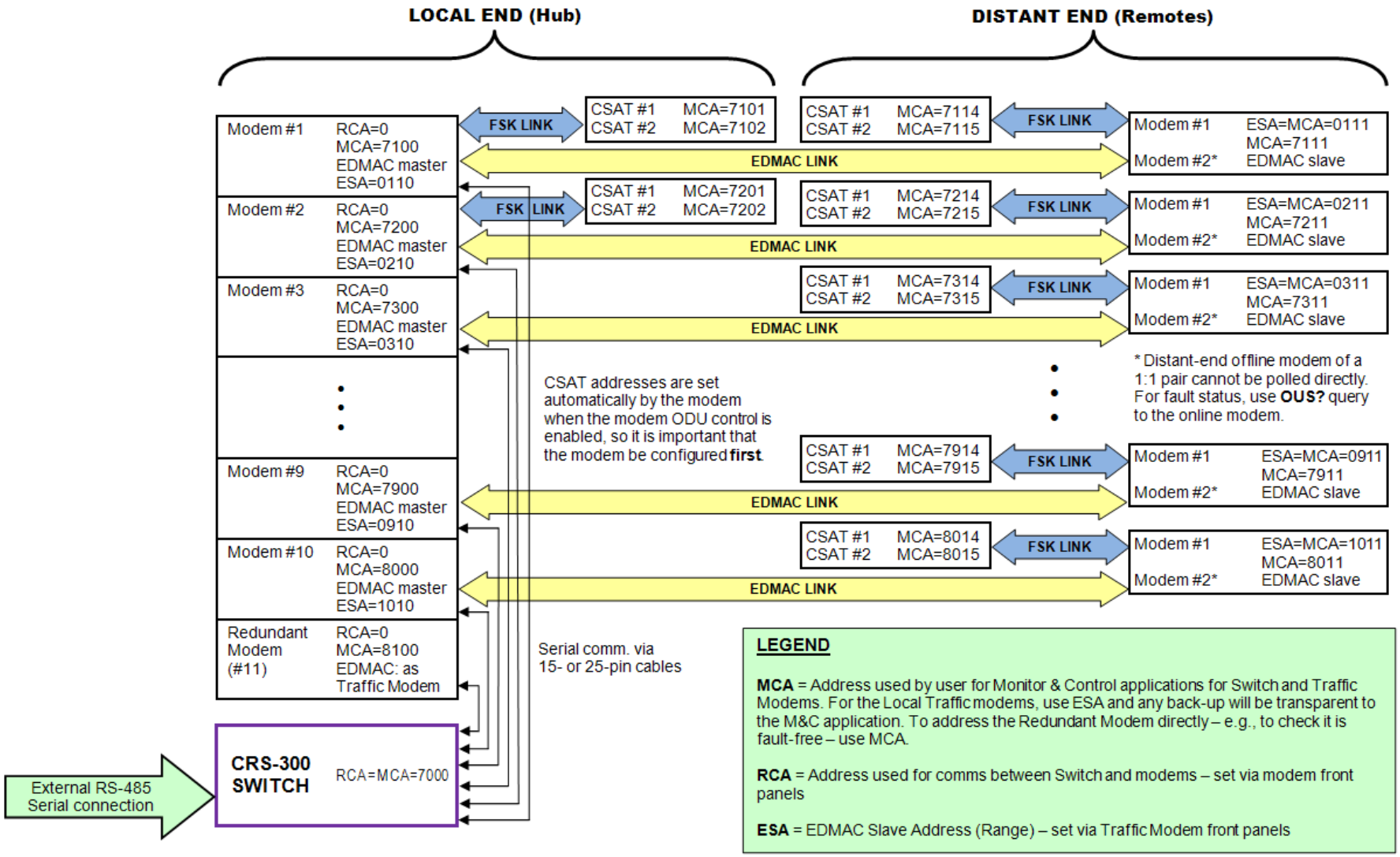

LOCAL END (Hub)
DISTANT END (Remotes)
Modem #1 RCA=0 MCA=7100 EDMAC master ESA=0110
Modem #2 RCA=0 MCA=7200 EDMAC master ESA=0210
Modem #3 RCA=0 MCA=7300 EDMAC master ESA=0310
Modem #9 RCA=0 MCA=7900 EDMAC master ESA=0910
Modem #10 RCA=0 MCA=8000 EDMAC master ESA=1010
Redundant Modem (#11) RCA=0 MCA=8100 EDMAC: as Traffic Modem
CRS-300 SWITCH RCA=MCA=7000
External RS-485 Serial connection
FSK LINK
EDMAC LINK
CSAT #1 MCA=7101 CSAT #2 MCA=7102
CSAT #1 MCA=7114 CSAT #2 MCA=7115
Modem #1 ESA=MCA=0111 MCA=7111 Modem #2* EDMAC slave
CSAT #1 MCA=7201 CSAT #2 MCA=7202
CSAT #1 MCA=7214 CSAT #2 MCA=7215
Modem #1 ESA=MCA=0211 MCA=7211 Modem #2* EDMAC slave
CSAT #1 MCA=7314 CSAT #2 MCA=7315
Modem #1 ESA=MCA=0311 MCA=7311 Modem #2* EDMAC slave
CSAT #1 MCA=7914 CSAT #2 MCA=7915
Modem #1 ESA=MCA=0911 MCA=7911 Modem #2* EDMAC slave
CSAT #1 MCA=8014 CSAT #2 MCA=8015
Modem #1 ESA=MCA=1011 MCA=8011 Modem #2* EDMAC slave
CSAT addresses are set automatically by the modem when the modem ODU control is enabled, so it is important that the modem be configured first
* Distant-end offline modem of a 1:1 pair cannot be polled directly. For fault status, use OUS? query to the online modem.
Serial comm. via 15- or 25-pin cables
LEGEND
MCA = Address used by user for Monitor & Control applications for Switch and Traffic Modems. For the Local Traffic modems, use ESA and any back-up will be transparent to the M&C application. To address the Redundant Modem directly – e.g., to check it is fault-free – use MCA.
RCA = Address used for comms between Switch and modems – set via modem front panels
ESA = EDMAC Slave Address (Range) – set via Traffic Modem front panels

Figure B-7. CRS-300 Addressing Scheme Example: External EIA-485 with CDM-570/570L, -600/600L, -625 Modems

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B.3.1 Setting Up Modems

- **Local Modem *m***, where ***m*** is modem position number (1 through 10) on Switch:
  - MCA = (Switch RCA) + (100 x ***m***)
  - Set EDMAC Framing on.
  - Set as EDMAC master.
  - Set with EDMAC Slave Address Range, ESA = (Modem RCA) + 10
- **Distant Modem 1** (attached to the Distant end of link to Modem ***m***):
  - Remote control address: no setting required (Remote control not used).
  - Set EDMAC Framing on.
  - Set as an EDMAC slave.
  - Set Slave Address, ESA = (Master ESA) + 1
  - MCA = ESA
- **Two Distant Modems** in a 1:1 configuration:

  Set up the on-line modem as for Distant Modem 1, described previously in this section. The offline modem is automatically configured to match the on-line modem. M&C can only be achieved to the online modem.

  Note: It is not possible for the offline modem of a 1:1 pair to respond to EDMAC messages directly as it is not transmitting. Using the internal 1:1 link, the online modem polls and retains the off-line modem status. Depending on the modem, this information can be obtained as follows:

  1. **For CDM-570/570L, CDM-600/600L, CDM-625 modems:**

     Use **OUS** (**O**ffline **U**nit **S**tatus) – **OUS?** for queries. This command/query is available in the following modems/firmware versions:

Modem	Firmware Version
CDM-570	1.4.1 or later
CDM-570L	1.3.1 or later
CDM-600	1.6.1 or later
CDM-600L	1.3.0 or later
CDM-625	1.1.1 or later

  2. **For CDM-Qx/QxL modems:**

     Use **FLT (F**au**lt**s and Status) – **FLT?** for queries. This command/query is available in available in firmware versions 1.6.2 or later.

     Note: 1:1 internal redundancy in EDMAC Slave mode is available only in firmware version 1.6.2 or later.

     Refer to the appropriate modem's *Installation and Operation Manual* for additional information.

B.3.2 Setting Up Transceivers

IMPORTANT

Configure the modems first for EDMAC operation, setting up the Remote Control Address (RCA) for local units, and ESA (EDMAC addresses) for EDMAC modems. A transceiver's address will be set automatically by its controlling modem if connected via the FSK link when the ODU enable is configured.

- **Local Transceiver 1** (linked to Modem ***m*** on the Switch):
    - First, set up the modem RCA, as described in Section B.3.1.
    - On the modem, key to **Enable ODU.**

      The modem automatically sets the transceiver address:

      Transceiver MCA = (Modem RCA) + 1.

- **Local Transceivers 1 & 2** (1:1 configuration, attached to Modem ***m*** on the Switch):
    - First, set up the modem RCA, as described in Section B.3.1.
    - On the online modem, key to **Enable ODU**.

      The modem automatically sets the transceiver addresses:

      MCA of Transceiver #1 = (Modem RCA) + 1

      MCA of Transceiver #2 = (Modem RCA) + 2

- **Distant Transceiver 1** (stand-alone):
    - First, set up the modems, first, as described earlier in this section. .
    - On the modem, key to **Enable ODU**.

      The modem automatically sets the transceiver address:

      Transceiver MCA = (Master ESA) + 4 = (Slave ESA) + 3

- **Distant Transceivers 1 & 2** (1:1 configuration):
    - First, set up the modem, as described earlier in this section.
    - On the modem, key to **Enable ODU**.

      The modem automatically sets the transceiver addresses:

      MCA of Transceiver #1 = (Master ESA) + 4

      MCA of Transceiver #2 = (Master ESA) + 5

B.4 M&C Applications

The system is set up such that it may be communicated to by an M&C application, e.g., SatMac or CMCS. In the SatMac application, go to the **Link Edit Mode** screen to enter the Monitor & Control Addresses (MCA).

Appendix C. REMOTE CONTROL

C.1 Overview

This appendix describes the protocol and message command set for remote monitor and control of the CRS-300 1:10 Redundancy Switch. The electrical interface is either an EIA-485 multi-drop bus (for the control of many devices) or an EIA-232 connection (for the control of a single device), and data is transmitted in asynchronous serial form using ASCII characters. Control and status information is transmitted in packets of variable length, in accordance with the structure and protocol defined in later sections.

Note: The Remote Control pin-out is shown in **Table 6-2** in **Chapter 6. CONNECTOR PINOUTS** for EIA-232 and EIA-485.

C.2 EIA-485

For applications where multiple devices are to be monitored and controlled, a full-duplex (or 4-wire plus ground) EIA-485 is preferred. Half-duplex (2-wire plus ground) EIA-485 is possible, but is not preferred. In full-duplex EIA-485 communication, there are two separate, isolated, independent, differential-mode twisted pairs, each handling serial data in different directions.

It is assumed that a 'Controller' device (a PC or dumb terminal) transmits data in a broadcast mode via one of the pairs. Many 'Target' devices are connected to this pair, and all simultaneously receive data from the Controller. The Controller is the only device with a line-driver connected to this pair – the Target devices have only line-receivers connected.

In the other direction, on the other pair each Target has a tri-state line driver connected, and the Controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one (and only one) Target transmits back to the Controller. Each Target has a unique address, and each time the Controller transmits, the address of the intended recipient Target is included in a framed 'packet' of data. All of the Targets receive the packet, but only one (the intended) will reply. The Target enables its output line driver and transmits its return data packet back to the Controller in the other direction, on the physically separate pair.

EIA-485 (full duplex) summary:

- Two differential pairs – one pair for Controller-to-Target, one pair for Target-to-Controller.
- Controller-to-Target pair has one line driver (Controller), and all Targets have line-receivers.
- Target-to-Controller pair has one line receiver (Controller), and all Targets have Tri-State drivers.

C.3 EIA-232

This is a much simpler configuration in which the Controller device is connected directly to the Target via a two-wire-plus-ground connection. Controller-to-Target data is carried, via EIA-232 electrical levels, on one conductor, and Target-to-Controller data is carried in the other direction on the other conductor.

C.4 Basic Protocol

Whether in EIA-232 or EIA-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART. The asynchronous character format may be selected as: 8-N-1 (8 data bits, no parity, one stop bit). The baud rate may vary between 300 and 19,200 baud.

All data is transmitted in framed packets. The Controller is assumed a PC or ASCII dumb terminal that is in charge of the process of monitor and control. The Controller is the only device that is permitted to initiate, at will, the transmission of data. Targets are only permitted to transmit when they have been specifically instructed to do so by the Controller.

All bytes within a packet are printable ASCII characters, less than ASCII code 127. In this context, the Carriage Return and Line Feed characters are considered printable.

All messages from Controller-to-Target require a response (with one exception). This will be either to return data that has been requested by the Controller, or to acknowledge reception of an instruction to change the configuration of the Target. The exception to this is when the Controller broadcasts a message (such as Set Time/Date) using Address 0, when the Target is set to EIA-485 mode.

C.4.1 Rules for Remote Serial Communications with the CRS-300

1. Always wait for a response (up to 15 seconds) from the CRS-300 before sending the next query or command.
2. If a "time-out" response ('~') is sent from the CRS-300, the user must resend the previous command.

   The '~' response indicates that a pass-through command to a modem/transceiver attached to the CRS-300 has "timed-out" and there was no response from the other device. During this wait, do not communicate with the CRS-300. After the '~' response is sent by the CRS-300, it is now ready to receive a message again. The CRS-300 knows to wait different times for the different messages it is sending to modems:

   - Status queries (no commands) are fast, (typically less than 333 ms).
   - Configuration changes (commands) take longer and vary by modem type.
   - Individual commands responses are faster than those to global commands (MGC). More parameters require more time.
   - A pass-through command is passed with little inspection by the switch,but remember the modem being addressed may be at the distant end of an EDMAC link! Types of pass-through commands:
     - To a local modem;
     - To a modem at the distant end (EDMAC);

- To a local BUC or transceiver connected to a local modem;
- To a distant end BUC or transceiver through the distant end modem.

C.5 Packet Structure

Controller-to-Target						
Start of Packet	**Target Address**	**Address Delimiter**	**Instruction Code**	**Code Qualifier**	**Optional Arguments**	**End of Packet**
< ASCII code 60		/ ASCII code 47		= or ? ASCII codes 61 or 63		Carriage Return ASCII code 13
(1 character)	(4 characters)	(1 character)	(3 characters)	(1 character)	(n characters)	(1 character)

Example: <0000/RSH=30[cr]

Target-to-Controller						
Start of Packet	**Target Address**	**Address Delimiter**	**Instruction Code**	**Code Qualifier**	**Optional Arguments**	**End of Packet**
> ASCII code 62		/ ASCII code 47		=, ?, !, or * ASCII codes 61,63,33 or 42		Carriage Return, Line Feed ASCII codes 13,10
(1 character)	(4 characters)	(1 character)	(3 characters)	(1 character)	(From 0 to n characters)	(2 characters)

Example: >0000/BBU=107[cr][lf]

C.5.1 Start of Packet

Controller-to-Target: This is the character '<' (ASCII code 60)

Target-to-Controller: This is the character '>' (ASCII code 62)

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message.

C.5.2 Target Address

While up to 9,999 devices can be uniquely addressed, connection to the CRS-300 imposes some basic limitations:

- In **EIA-232** applications, the Switch address is fixed at 0000.
- In **EIA-485** applications, the Switch may be set to an address of 1000, 3000, 5000 or 7000. This allows up to four Switches to be connected on the same bus.
- The 11 modems that may be connected to the Switch may be accessed for remote monitor & control through the Switch via *virtual* addresses. The details of this addressing scheme is shown in **Appendix B. ADDRESSING SCHEME INFORMATION**. Valid remote commands and queries that can be sent to the modems via the Switch depend upon the

modem protocol and the installed options. Consult the appropriate modem *Installation and Operation Manual* for further information.

Note that, regardless of the Switch COMs being set up for either EIA-232 or EIA-485 mode, the internal link between the Switch and the modems is fixed:

For CDM-600L or CDM-570L modems:
RS-232, 9600 baud, 8-N-1, address 0

For CDM-QxL modems:
RS-485, 9600 baud, 8-N-1, correct address
***(see* Appendix B. ADDRESSING SCHEME INFORMATION)**

For SLM-5650 modems:
TTL Switch, 9600 baud, 8-N-, address N/A

Note that, for the purpose of clarity, the examples here refer to the old Recommended Standard (RS) designation rather than the new designation of the Electronic Industries Association (EIA).

The Controller sends a packet with the address of a Target - the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.

The Comtech SatMac application software (Version 3.6 or higher) can monitor and control a CRS-300 redundancy system. The address scheme details are shown in **Appendix B. ADDRESSING SCHEME INFORMATION**.

There also are address restrictions for distant-end modems (being accessed by EDMAC) and Comtech transceivers, connected either locally or at the distant-end of a link. See **Appendix B. ADDRESSING SCHEME INFORMATION** for detailed addressing information and diagrams.

C.5.3 Address Delimiter

This is the “forward slash” character '/' (ASCII code 47).

C.5.4 Instruction Code

This is a three-character alphabetic sequence that identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance. For example, BKH is for BacKup Hold-off time; SID is for Switch ID, etc. This aids in the readability of the message if seen in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65-90).

C.5.5 Instruction Code Qualifier

This single character further qualifies the preceding instruction code. Code Qualifiers obey the following rules:

1. From **Controller-to-Target**, the only permitted values are:

= **(ASCII code 61)**	The **=** code is used as the **assignment** operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. For example, BKH=12 would mean 'set the BacK-up Hold-Off time to 12 seconds.'
? **(ASCII code 63)**	The **?** (ASCII code 63) is used as the **query** operator, and is used to indicate that the Target should return the current value of the parameter defined by the preceding byte. For example, BKH? means 'what is the current value of BacK-up Hold-Off time?'

2. From **Target-to-Controller**, the only permitted values are:

= **(ASCII code 61)**	The = code is used in two ways: First, if the Controller has sent a query code to a Target (for example: BKH? meaning 'what is the BacK-up Hold-Off time?'), the Target would respond with BKH=xx, where xx represents the time in question. Second, if the Controller sends an instruction to set a parameter to a particular value, then, providing the value sent in the argument is valid, the Target will acknowledge the message by replying with BKH= (with no message arguments).
? **(ASCII code 63)**	The **?** code is only used as follows: If the Controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is not valid, the Target will acknowledge the message by replying (for example) with BKH? (without message arguments). This indicates that there was an error in the argument of the message sent by the Controller.
! **(ASCII code 33)**	The **!** code is only used as follows: If the Controller sends an instruction code that the Target does not recognize, the Target will acknowledge the message by echoing the invalid instruction, followed by the ! character with. Example: XYZ!
***** **(ASCII code 42)**	The * code is only used as follows: If the Controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is valid, but the modem will not permit that particular parameter to be changed at that time, the Target will acknowledge the message by replying (for example) with BKH* (with no message arguments).
# **(ASCII code 35)**	The # code is only used as follows: If the Controller sends a correctly formatted command, BUT the modem is not in remote mode, it will not allow reconfiguration, and will respond with, for example, **BKH#** (with no message arguments)**.**
~ **(ASCII Code 126)**	The ~ code is only used as follows: If a message was sent via the Switch to an attached modem or ODU, the message was transmitted transparently through the Switch. In the event of the other device not responding, the Switch would generate a response e.g. 0100/MGC~ indicating that it had finished waiting for a response and was now ready for further COMs.

C.5.6 Optional Message Arguments

Arguments are not required for all messages. Arguments are ASCII codes for the characters 0 to 9 (ASCII codes 48-57), A to Z (ASCII codes 65-90), period (ASCII code 46) and comma (ASCII code 44).

C.5.7 End of Packet

Controller-to-Target: This is the 'Carriage Return' character (ASCII code 13).

Target-to-Controller: This is the two-character sequence 'Carriage Return', 'Line Feed' (ASCII codes 13 and 10).

Both indicate the valid termination of a packet.

C.6 Remote Commands and Queries

Where Column 'C' = Command; Column 'Q' = Query: Columns marked (X) indicate Command only, Query only, or Command/Query for Instruction Code.

Instr Code	C	Q	Page
AAM	X	X	C-7
ACT	X	X	C-7
AMQ		X	C-7
BBU	X	X	C-7
BKH	X	X	C-7
CAE	X		C-7
CLD	X		C-8
CST	X	X	C-8
DAY	X	X	C-8
EID		X	C-8
FLT		X	C-9
LRS	X	X	C-9
MAM	X	X	C-9
MOD		X	C-10

Instr Code	C	Q	Page
NUE		X	C-10
OPM	X	X	C-10
PRI	X	X	C-10
RNE		X	C-11
RSH	X	X	C-11
SAM	X	X	C-12
SDT	X	X	C-12
SGC	X	X	C-12
SID	X	X	C-12
SNO		X	C-13
SWR		X	C-13
TIM	X	X	C-13
XMI		X	C-14

Note: The following codes are used in the '**Response to Command**' column:

Code	Meaning
=	Message OK
?	Received OK, but invalid arguments found
*****	Message OK, but not permitted in **Current** mode
#	Message OK, but only permitted in **Remote** mode
~	Timed out a pass-through message
!	Unknown command

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Audio Alarm Mask	AAM=	1 byte, numerical	Command or Query. Where x indicates the Audio alarm mask: 0 = no faults masked (audio enabled in response to any fault) 1 = Switch faults masked 2 = Modem faults masked 3 = All faults masked (audio never enabled)	AAM= (message OK) AAM? (received OK, but invalid arguments found) AAM# (message OK, but only permitted in Remote mode)	AAM?	AAM=x (see Description of Arguments)
Active Modems	ACT=	10 bytes, numerical	Command or Query. Where x is the active state of all 10 Traffic Modems: 0 = de-activate Traffic Modem (except if in back-up) 1 = activate Traffic Modem Redundant modem is always active.	ACT= (message OK) ACT? (received OK, but invalid arguments) ACT* (message OK, but not permitted in current mode)	ACT?	ACT=xxxxxxxxxx (see Description of Arguments)
Active Modem Query	N/A	10 bytes, numerical	Query only. Where x indicates the state of all 10 Traffic Modems: 0 = TMI not present. Modem cannot be activated. 1 = TMI present, but modem not activated. 2 = TMI present, modem activated and responding. 3 = TMI present, modem activated but not responding.	N/A	AMQ?	AMQ=xxxxxxxxxx (see Description of Arguments)
Bridged or Backed-up Modem Number	BBU=	3 bytes, numerical	Command or Query. The bridge/back-up state, followed by the selected TM to be acted on, where: x is 0 = bridge 1 = back-up (only possible when in manual mode); and yy is 01-10 for modem number	BBU= (message OK) BBU? (received OK, but invalid arguments) BBU* (message OK, but not permitted in current mode)	BBU?	BBU=xyy (see Description of Arguments)
Backup Holdoff Time	BKH=	2 bytes, numerical	Command or Query. The backup holdoff time is the delay when auto mode prepares to backup a faulted modem, where: 01-99 = # of seconds delay after Redundant Modem has acquired Traffic Modem's configuration before online swap actually takes place.	BKH= (message OK) BKH? (received OK, but invalid arguments) BKH# (message OK, but only permitted in Remote mode)	BKH?	BKH=xx (see Description of Arguments)
Clear All Stored Events	CAE=	None	Command only. Instructs the unit to clear all Stored Events. This command takes no arguments.	CAE= (message OK) CAE# (message OK, but only permitted in Remote mode)	N/A	N/A

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Config Load	CLD=	1 byte, numerical, 0 to 9	Command only. Forces the Switch to retrieve the Configuration Memory location defined by the argument (0 to 9) and to re-program the Switch with that stored configuration.	CLD= (message OK) CLD? (received OK, but invalid arguments found) CLD* (message OK, but the memory location does not contain configuration info)	N/A	N/A
Config Store	CST=	1 byte, numerical, 0 to 9	Command or Query. The command forces the Switch to store the its current configuration in Configuration Memory location defined by the argument (0 to 9). Example: CST=4 (Store current configuration in location 4) WARNING: Use with caution! If the location already contains data, it will be automatically overwritten. If in doubt, query the location first. The query returns the contents of the location.	CST= (message OK) CST? (received OK, but invalid arguments found) CST# (message OK, but only permitted in Remote mode)	CST?n where n is 0 to 9	Returns the same format as the SGC, with the form: CST=xxx....xxx for a valid config, and CST* where no valid config is found
Date	DAY=	6 bytes, numerical	Command or Query. The date, in the form ddmmyy (international date convention), where: dd = day of the month, between 01 and 31, mm = month of the year, between 01 and 12, and yy = year, between 97 and 96 (1997 to 2000, then 2000 to 2096) Example: DAY=240457 would be April 24, 2057.	DAY= (message OK) DAY? (received OK, but invalid arguments) DAY# (message OK, but only permitted in Remote mode)	DAY?	DAY=ddmmyy (see Description of Arguments)
Equipment ID	N/A	4 bytes, alphanumeric	Query only. Unit returns information concerning the equipment identification. Example: S300	N/A	EID?	EID=xxxx (see Description of Arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Faults and Status	N/A	15 bytes, alphanumeric	Query only. Unit returns the current fault and status codes for the Switch itself, where: r = Redundant Modem: 0 = OK 1 = RMI not present 2 = RM I/O timeout 3 = RM not in remote mode 4 = RM is in a test mode 5 = RM is rejecting MGC configuration string 6 = CDM-Qx: Interface is set for IP – No Coms available 7 = CDM-700: RM is rejecting an interface configuration string Power supply information, values 0 or 1 only. A/a = + 5V PSU-A under/over B/b = +5V PSU-B under/over C/c = +12V PSU-A under/over D/d = +12V PSU-B under/over E/e = -12V PSU-A under/over F/f = -12V PSU-B under/over m is TMI: interface mismatch: 0 = no problem, 1-9, A (for pos 10) indicates the position of a TMI interface mismatch i is modem I/O communications: 0 = no problem, 1-9, A (for pos 10) indicates the position of a modem which has been activated but is not responding.	N/A	FLT?	FLT=rAaBbCcDdEeFfmi (see Description of Arguments)
Local/ Remote Status	LRS=	1 byte, value of 0 or 1	Command or Query. Where x indicates the local/remote status of the Switch: 0 = local 1= remote	LRS= (message OK) LRS? (received OK, but invalid arguments found)	LRS?	LRS=x (see Description of Arguments)
Modem Alarm Mask	MAM=	1 byte, numerical	Command or Query. Where x indicates the Modem alarm mask: 0 = no faults masked 1 = Tx faults masked 2 = Rx faults masked 3 = Both Tx and Rx faults masked	MAM= (message OK) MAM? (received OK, but invalid arguments found) MAM# (message OK, but only permitted in Remote mode)	MAM?	MAM=x (see Description of Arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Modem type	N/A	3 bytes, alphanumeric	Query only. Unit returns information concerning the model of the Redundant Modem attached, where xxx is: 600 601 indicates 600L 570 571 indicates 570L Qx0 indicates Qx modem, 70-140MHz Qx1 indicates Qx modem, L band. 700 indicating the CDM-700 modem 710 indicating the CDM-710 modem 5650 indicating the SLM-5650 modem	N/A	MOD?	MOD=xxx (see Description of Arguments)
Number of Unread Stored Events	N/A	2 bytes, numerical	Query only. Switch returns the number of Stored Events, which remain unread. Note: This means unread over the remote control. Viewing the stored events from the front panel of the modem does not affect this value. Example: NUE=98	N/A	NUE?	NUE=xx (see Description of Arguments)
Operating Mode	OPM=	1 byte, numerical	Command or Query. Where x indicates the operating mode: 0 = manual mode 1 = auto mode	OPM= (message OK) OPM? (received OK, but invalid arguments) OPM# (message OK, but only permitted in Remote mode)	OPM?	OPM=x (see Description of Arguments)
Priority mode	PRI=	2 bytes, numerical	Command or Query. Priority mode, where xx is: 00 (priority mode disabled) 01 through 10 – priority link number The Switch will back-up the priority link if: Priority mode is enabled. A fault occurs on the priority link, even if it is already backing-up another (non-priority) link. Note: See Section 7.4.3 for additional information.	PRI= (message OK) PRI? (received OK, but invalid arguments) PRI* (message OK, but not permitted in current mode)	PRI?	PRI=xx (see Description of Arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Retrieve Next 5 unread Stored Events	N/A	80 bytes	Query only. Switch returns the oldest 5 Stored Events, which have not yet been read over the remote control. Reply format: [cr]Sub-body[cr]Sub-body[cr]Sub-body[cr]Sub-body[cr]Sub-body, where Sub-body = KLMddmmyyhhmmss K is the fault/clear indicator, where F = Fault, C = Clear, I = Info L is the faulting/clearing unit, where the values can be: 1,2,...9 indicating traffic modems 1,2...9, A=modem 10, B=Redundant Modem C=Switch D=Info M is the fault code, where value depends on faulting unit: Switch codes are 1 to F, indicating the position (1-15) of the fault within the Switch FLT string. Modem codes are: 1= Unit, 2= Rx traffic, 3= Tx traffic Info codes are: 0= Power off, 1= Power on, 2= Log cleared ddmmyy is the date of the event (international format). hhmmss is the time of the event. If there are no new events, the unit replies with RNE*. If fewer than 5 events remain, the last positions are filled with zeroes.	N/A	RNE?	RNE=[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss (see Description of Arguments)
Restore Holdoff Time	RSH=	2 bytes, numerical	Command or Query. The restore holdoff time is the delay when auto mode prepares to return a modem (previously faulted, now good) back online due to a different Traffic Modem's failure, where: 01-99 = # of seconds after offline Traffic Modem lost its fault before it is put back online so that Redundant Modem can bridge the newly faulted modem.	RSH= (message OK) RSH? (received OK, but invalid arguments found) RSH# (message OK, # (message OK, but only permitted in Remote mode)	RSH?	RSH=xx (see Description of Arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Switch Alarm Mask	SAM=	1 byte, numerical	Command or Query. Where x indicates the Switch alarm mask: 0 = no faults masked 1 = PSU-A faults masked 2 = PSU-B faults masked	SAM= (message OK) SAM? (received OK, but invalid arguments found) SAM# (message OK, but only permitted in Remote mode)	SAM?	SAM=x (see Description of Arguments)
SwitchDataTime	SDT=	1 byte, numerical	Command or Query. This command allows the Switch to send commands to all attached modems on a daily basis to set their time and date values to the same as the Switch. This value is also saved in nonvolatile memory to retain setting during a power outage. The factory default setting is SDT=0. SwitchDataTime, where x where: 0 turns off this feature. 1 enables this feature Example: SDT=1	SDT= (message OK) SDT? (received OK, but invalid arguments) SDT* (message OK, but not permitted in current mode)	SDT?	SDT=xx (see Description of Arguments)
Switch Global Configuration	SGC=	29 bytes, numerical	Command or Query. Global configuration of the Switch, in the form: OaaaaaaaaaaBNNbbrrMSAsssssss, where: O = Operating Mode – same as OPM (1 bytes) a = Active Modems – same as ACT (10 bytes) B = Bridge/Backup State – same as BBU (1 byte) N = Selected TM Number - same as BBU (2 bytes) b = Backup Holdoff Time – same as BKH (2 byte) r = Restore Holdoff Time – same as RSH (2 byte) M = Modem Alarm Mask – same as MAM (1 byte) S = Switch Alarm Mask – same as SAM (1 byte) A = Audio Alarm Mask – same as AAM (1 bytes) P = Priority mode – same as PRI s = 7 spare bytes	SGC= (message OK) SGC? (received OK, but invalid arguments found) SGC# (message OK, but only permitted in Remote mode)	SGC?	SGC=OaaaaaaaaaaBNNbbrrMSAPsssssss (see Description of Arguments)
Switch ID	SID=	24 bytes, ASCII	Command or Query. A user-defined Switch ID, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + - , . / 0-9 and A-Z.	SID= (message OK) SID? (received OK, but invalid arguments found) SID# (message OK, but only permitted in Remote mode)	SID?	SID=xxxxxxxxxxxxxxxxxxxxxxx (see Description of Arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Serial Number	N/A	9 bytes, numerical	Query only. Unit returns its 9-digit serial number. Example: SNO=176512523	N/A	SNO?	SNO=xxxxxxxxx (see Description of Arguments)
Software Revision	N/A	4 bytes, numerical	Query only. Unit returns the value of internal software revision installed in the unit, in the form x.xx Example: SWR=1.03 (Ver 1.03)	N/A	SWR?	SWR=x.xx (see Description of Arguments)
Time	TIM=	6 bytes, numerical	Command or Query. The time from midnight, in the form hhmmss, where hh = hours, between 00 and 23, mm = minutes, between 00 and 59, and ss = seconds, between 00 and 59 Example: TIM=231259 would be 23 hours, 12 minutes and 59 seconds from midnight.	TIM= (message OK) TIM? (received OK, but invalid arguments) TIM# (message OK, but only permitted in Remote mode)	TIM?	TIM=hhmmss (see Description of Arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numerical codes, that is, ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
TMI/RMI types	N/A	11 Bytes	Query only. Where x indicates theTMI type detected in each slot position: 0 = none present 1 = CRS-320 Rev A 2 = CRS-330 3 = CRS-340 Rev A 4 = CRS-340 Rev B 5 = CRS-370 (HSSI) 6 = CRS-320 Rev C 7 = Undefined 8 = CRS-341 9 = CRS-316 A = CRS-336 B = Undefined C =CRS-315 (TMI) D = CRS-325 (TMI) E =CRS-335 (TMI) F = CRS-345 G= CRS-365 Quad E1 for CDM-Qx H= CRS Quad E1 D-sub for CDM-625 y indicates the RMI detected in slot II 0 = none present 7=CRS-310 D=CRS-307 E=CRS-306 F=CRS-305 Example: XMI=21000000007	N/A	XMI?	XMI=xxxxxxxxxxy (see Description of Arguments)

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

Formulas
° C = (F - 32) * 0.555
° F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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